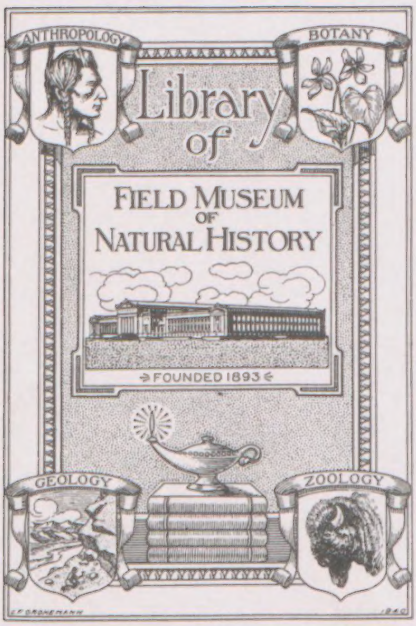
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PLANT LIFE

VOLUMES 21-25
1965-1969, incl.

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
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PLANT LIFE

VOLUME 21

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1965

EDITED BY
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CORRIGENDA

THE GENERA OF AMARLLIDACEAE, BY HAMILTON P. TRAUB PUBL. 1963

See Plant Life 20: p. v. 1964 for earlier corrigenda.

Page 27, in lower part of page, between "INFRAFAMILY" and "PANCRATIOIDINAE" change "III" to "II".
Page 31, under "1.MILULA", 3rd line change "11" to "161".
Page 76, under "Subgenus 2. ELISENA", 1st line, change "19: 77. 1963" to "21:96. 1965."
under "Subgenus 3. PSEUDOSTENOMESSON", 2nd line, change "78. 1963" to "21:96. 1965."
under "Subgenus 4. ISMENE", 1st and 2nd lines, change "19: 88. 1963" to "21:96. 1965."
under "93. EURYCLES", 2nd line, change "Herb." to "Bak."

CORRIGENDA

LINEAGICS, BY HAMILTON P. TRAUB

Published Aug. 6, 1964

CORRIGENDA

Page 18, second line, change "332" to "322".
Page 19, under 1865, first line, change "ingetitance" to "inheritance".
Page 22, under "1963—(d)", change "Maryr" to "Mayr".
Page 27, Table 1, at end of 2nd line, delete "the".
Table 1, II, change "cretaceous" to "cetaceous".
Page 33, 6th line from top, change "1662" to "1622".
Page 34, second to last paragraph, beginning with "Microorganism etc.", first line, change "1660" to "1680".
Page 37, in section heading "(B)", change "ANDANSONIAN" to "ADANSONIAN".
Page 50, Table 10, 4th line of caption, change "Thompson" to "Thomson".
Page 53, third paragraph, 9th line, after "acceptable" add "group".
Page 61, end of line 16 and beginning of line 17, from bottom, change "func/tion" to "functions".
Page 62, Figure 2, caption, third line, change "meterology" to meteorology".
Page 69, fifth paragraph, 6th line, change "(age)" to "(eage)".
Page 85, under "(a)" REALITY OF, AND TERMINOLOGY FOR, HIERARCHIC LINEAGES OR PHYLONS", change "above" to "based on".
Page 91, under "PARALLELISM", third paragraph, 3rd line, change "common" to "related".
Page 92, 5th line from bottom, change "*renleesteuii* to "*ranleisteni*".
Page 96, third line from bottom, change "includs" to "includes".
Page 99, Table 15, align "5a" with "(b) impediolinon"; change second "5a" to "5b", and align it with "(c) desinolinon".
Page 102, second line from bottom, change "12" to "13".
Page 103, first paragraph, 11th line, change "inclusive" to "inconclusive".
Page 108, under section "(b)", 2nd line, after "often", insert "of".
Page 112, under "(C) FROM AUTOTROPHY TO SECONDARY HETEROTROPHY", second paragraph, after fifth line, insert missing line, "autotrophs, known as *obligate autotrophs,* obtain their nutrition".
Page 117, paragraph below Table 21, second line, change "*Spirochetobacae*" to "*Spirochetobacae*". In the following paragraph, 6th line, between "from" and "standpoint", insert "the".
Page 121, 5th line from bottom, between "with" and "state", insert "the".
Page 123, 6th line from top, after "pointed" insert "out", and in fourth paragraph, center, 6th line down, at end of line add "(b)".

Page 126, under "THE HIERARCHIC TAXA", end of first line, change "were" to "was". And line 11 from bottom, insert comma "," between "*order*" and "*class*".

Page 127, 2nd line from top, delete "that". And 21st line from top, change "of" to "or".

Page 129, under section "D", top, 3rd paragraph, 2nd line, change "are" to "is".

Page 132, last line of first paragraph, after "Andrews et al" insert "Virol".

Page 133, middle of page, the paragraph beginning with "Physum 8. *Myxobacae*", first line, change "red-shaped" to "rod-shaped".

Page 138, under SUBKINGDOM 3. *ANIMALIA*, 6th line, change "subkingdoms" to "infrakingdoms".

Page 142, under Phylum 5. *CHLOROBACAE*, Family 1. Chlorobiaceae, change "(*Chloronium*)" to "(*Chlorobium*)".

Under Phylum 6. *CHROMOBACAE*, Class 2, Order 1, Family 1, change "(*Phodopseudomonas*)" to "(*Rhodopseudomonas*)".

Page 150, under "(b) CONVERSION FROM LINES, etc.", 1st column, 2nd line from bottom, change "30.45" to "30.48".

Page 155, after entry, "Just, T., etc.", insert entry, "Keith, The Theory of Human Evolution. 1949."

Page 157, after entry, "Rothmaler, W. etc.", insert the entry, "Royal Society, The, of London, Notes and Records, 14: No. 1. 1959."

ADDENDA TO "TRAUB, LINEAGICS" (1964)

THE LINEAGICIST IS A SCIENTIST, NOT A KEEPER

Due to space limitations in Chapter 3, it was not possible to consider the matter suggested by the above title in "Lineagics" (Traub, 1964). It does appear now that this subject should not be put off until the publication of the complete text later, and this is a sufficient reason for this brief addenda note.

Unfortunately, the role of the lineagicist has been misunderstood all these hundreds of years, and in our time he has often been given the title "curator" (sometimes even "keeper"). "Curator" signifies "a person having the care of anything, an overseer, keeper, or custodian of a museum". In the present case it refers to the housing and care of preserved specimens of organisms fossil and recent, and/or parts thereof. The care of such specimens can be entrusted to anyone with an adequate *technical* training, but the role of the lineagicist transcends such a technical role (see Traub, 1964). He should be a full-fledged scientist who works in the field of lineagics. He makes use of preserved specimens of organisms, and a wide variety of other tools, and his role should never be confused with that of a mere "keeper". Lineagicists therefore have the right to receive titles commensurate with the important scientific function that they perform. Such titles could consist of the following:

Director, of the section of lineagics, in the division of biology
Chief Lineagicist, or *Professor of Lineagics**
Lineagicist, or *Associate Professor of Lineagics**
Assistant Lineagicist, or *Instructor in Lineagics**

* When research and teaching functions are combined.

The title of "curator" should be reserved for those who have adequate technical training in (a) the making of slide preparations of, and the culturing of, procaryotes, microscopic plants, hetertroplants (fungi) and animals; and (b) preserving microscopic plants, heteroplant (fungi) and animal specimens, and (c) the care of such preparations and specimens. Such workers, who have not received a comprehensive scientific training could make a career in this field, or they may work on a temporary basis while pursuing graduate work to prepare themselves to join the ranks of the lineagicists. Appropriate titles in this field could include:

Chief Curator, in the section of lineagics, in the division of biology
Curator
Associate Curator
Assistant Curator

LITERATURE CITED

Traub, Hamilton P. Lineagics. 1964.

ALTERNATE FOR "PRIMARY HETEROTROPH" HYPOTHESIS

In Traub (Lineagics. 1964), Chapter 4, under "(a) Hypotheses on the Coming into Being of Organisms" (pages 72-73), the alternate hypothesis of Needham ("The Origination of Life", in Quart. Rev. Biol. 34: 189-209. 1959), should be considered.

Needham (1959) has recently subjected the 'primary heterotroph' hypothesis, which he characterizes as an 'ametabolic view', to criticism. He proceeds on the assumption that the origination of life was "a spontaneous, natural sequence of 'most probable' events. Survival by natural selection is a particular example of a most probable event, and therefore operated at all stages of the origination. True evolutionary novelties have been most probable responses to new environmental conditions, and may have become rarer as the rate of change of the causal conditions decreased." He explains that "it is more probable that all significant materials and actions were acquired early, panglobally and in quantity, and that subsequent evolution was restricted (a) to most probable innovations . . . . and (b) to less fundamental changes, depending in part on changes in the biological environment itself. In general there has been biological simplification during evolution, rather than the converse." According to Needham (1959), an 'ametabolic' view such as that proposed by Oparin and others "leads to the questionable conclusions that there were originally no autotrophs, no photoactivated endergonic syntheses, no need for solar energy, and no decay, that the initial heterotrophs could feed indefinitely on a limited store of pristine compounds, and that generally reducing conditions prevailed on the early earth. This view fails to recognize that the general level of oxidation

is less important than the maintenance of a potential difference in free energy between organism and environment. It also tends to overlook the relative rapidity of the circulation of organic materials through living systems, and the evolutionary implications of this."

It should also be added that apparently there is no evidence for evolution from heterotrophy to autotrophy and this is in harmony with the principle of irreversibility. Once a heterotroph always a heterotroph.

LITERATURE CITED

Oparin, A. I. The Origin of Life. Dover, N. Y. 1953. See also Oparin, A. I. The Chemical Origin of Life. Academic Press. N. Y. 1964.

Needham, A. E. The Origination of Life, in Quart. Rev. Biol. 34: 189-209. 1959.

Traub, Hamilton P. Lineagies. 1964.

PLANT LIFE LIBRARY—continued from page 162.

ONIONS AND THEIR ALLIES, by H. A. Jones and L. K. Mann. Leonard Hill (Publ.), London; Interscience Publ., New York; and John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1963. Pp. 286. Illus. $12.50. This is the latest item in the important World Crops Books series. It is authored by two outstanding authorities in the field covered. The book is adequately illustrated, and will be welcomed not only by scientists and research workers but also by others concerned with the production of onions and allied crops. The topics covered include world onion production; history; grouping and identification; morphology and development; food value and chemical composition; genetics and cytology; breeding; adaptation of cultivars; growing and handling onion sets, transplants and seedlings; harvesting and handling; weed, disease and pest control; onion products; garlic and other onion allies. Highly recommended.

BOTANY—AN INTRODUCTION TO PLANT SCIENCE, 3rd Edition, by W. W. Robbins, T. E. Weier and C. R. Stocking. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1964. Pp. 614. Illus. $8.95. This third edition of an outstanding first course in botany will be welcomed. Without decreasing the emphasis on the plant as a whole, and its relation to its environment, the authors have added the new dimension of subcellular form and function made possible by recent developments in biology. This clearly written, adequately illustrated text is highly recommended.

ADVANCES IN ENZYMOLOGY AND RELATED SUBJECTS OF BIOCHEMISTRY, Vol. 26, edited by F. F. Nord. Interscience Publ., a division of John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016, 1964. Pp. 453. Illus. $12.50. This volume includes contributions by fourteen outstanding authorities. The topics covered include phytochrome and its control of growth and development; sugar nucleotides and the synthesis of carbohydrates; formation of secondary and tertiary structure enzymes; Die Wasserstoffuebertragung mit Pyridinnucleotiden; bagshaped macromolecules; Fortschritte auf dem Vitamin B-12—Gebiet; and the metabolism of propionic acid. Highly recommended.

EXPERIMENTAL BIOLOGY, by R. W. Van Norman, Prentice-Hall, Englewood Cliffs, N. J. 1963. Pp. 243. Illus. This is an introduction to methods, techniques and instruments used in experimental research in biology, and is particularly useful to the beginning student. The introductory chapters are concerned with science and research in general, and biological science in particular. The main body of the text is devoted to the methods, techniques and instruments commonly used in experimental biology. The concluding chapters are concerned with the design of experiments, the handling of experimental data; and the preparation of manuscripts. Highly recommended.

THE NATURAL GEOGRAPHY OF PLANTS, by H. A. Gleason and A. Cronquist. Columbia University Press, 2960 Broadway, New York, N. Y. 10027. 1964. Pp. 420. Illus. $10.00. This outstanding clearly written and easily readable text on plant geography will be welcomed by the specialist and the amateur. The first half is devoted to the factors involved in plant distribution, such as plant migration and "community life"; and the conditions on which they depend. The second half is concerned with the ten floristic provinces of the United States, and Canada, on the basis of common species and plant communities. The illustrations are outstanding and are worth the price of the entire book. Highly recommended.

FLORA EUROPAEA. Vol. I. *Lycopodiaceae* to *Platanaceae*, edited by T. G. Tutin, V. H. Heywood, D. H. Valentine, S. N. Walters, and D. A. Webb. Cambridge University Press, 32 East 57th St., New York, N. Y. 10022. 1964. xxxiv + 464 pp. Illus. (maps). $16.00. This is an outstanding book, the first of a planned four volumes. The present project of an European Flora was first discussed by European lineagicists in 1954; this was followed in 1956 by a steering committee of nine. This committee in 1958 published a brief guide for contributors, and appointed an editor for each family with the objective of producing a concise and complete Flora in the shortest possible time. The editors, and all who contributed to the book, are to be congratulated on producing the first volume by 1964. The English Language was chosen because more lineagicists can communicate adequately in that language than any of the others. The families are arranged according to Engler and Diels as of 1936, but the Monocots follow the Dicots. The magnitude of the project can be judged from the fact that more than 40 committee members, advisors and consultants, and 51 contributors, have cooperated in producing this first volume.

After the introduction, there is a synopsis of the 79 families (to *Platanaceae*) included; keys to the major taxa of the families included in Volume One, and also to those which are to appear in the three volumes to follow; and explanatory notes on the text. Then follows the main text with descriptions of the families, genera, species, and subspecies. The appendices include keys to the abbreviations of authors, books and periodicals referred to in Volume One; a glossary of technical terms; vocabularium anglo-latinum; the index to families, genera, species and subspecies; and maps showing subdivisions of Europe.

This wonderful book cannot be praised too highly, and will be welcomed by all interested in plants. It is a handsome, easily readable volume which is highly recommended.

PLANT LIFE LIBRARY—continued on page 4.

PLANT LIFE, VOL. 21, NO. 1, January, 1965

AMARYLLIS
YEAR BOOK
1965

Year Book of
The American Amaryllis Society
32nd Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
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The Dallas Amaryllis Society, Mrs. E. P. Carpenter, Pres., 6224 Tremont St., Dallas, Texas.

The Shasta Garden Club, Mrs. J. W. Gamblin, **Pres.,** 162 Sunshine Drive E., San Antonio, Texas.

The Houston Amaryllis Society, Mrs. A. C. Pickard, **Pres.,** 1702 N. Blvd., Houston 6, Texas.

The Hattiesburg (Miss.) Amaryllis Society, Mrs. Sam Forbert, **Pres.,** 117 North 23rd Ave., Hattiesburg, Miss.

Men's Amaryllis Club of New Orleans, Mr. Edw. F. Authement, **Corr. Sec.-Treas.,** 2214 Gallier St., New Orleans, La. 70117.

The Mobile Amaryllis Forum, Mr. J. W. Van Esler, **Pres.,** Spring Hill, Ala.

The Coastal Bend Amaryllis Society, Mr. Fred B. Jones, **Pres.,** 521 Vaky St., Corpus Christi, Texas.

The Men's Garden Club of Valdosta, Georgia, Mr. Guy L. Rice, **Pres.,** 506 Gornto Road, Valdosta, Georgia.

The Greater Houston Amaryllis Club, Mrs. Sally Fox, **Corr. Secy.,** 1527 Castle Court, Houston, Texas 77006.

The Palestine Amaryllis Society, Mrs. Arcala N. Herrington, **Sec'y,** 839 Tennessee Ave., Palestine, Tex.

The Southern California Hemerocallis & Amaryllis Society, Mrs. Dorothy Rose, **Secy.,** 10300 Rosewood Ave., South Gate, Calif.

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Mr. S. Y. Caldwell, **Tenn.**
Mr. Robt. D. Goedert, **Fla.**

*Deceased.

(b) CORRESPONDING FELLOWS

Antilles—Dr. H. F. Winters, **Mayaguez, Puerto Rico**
Brasil—Dr. Alberto Castellanos, **Rio de Janeiro**
Australia—Mr. Wm. Morris, **Warners Bay, New South Wales**
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England—Mr. Reg. F. Harradine, Potters Bar
India—Mr. Sydney Percy-Lancaster, **Lucknow**
South Africa—Mr. Leon Boshoff-Mostert, **Balfour**
Argentina—Prof. Pedro F. Ravenna, **Buenos Aires**

PREFACE

Again Prof. Goff has provided an outstanding 1965 cover design featuring *Amaryllis Calyptrata* as grown at the Los Angeles State and County Arboretum at Arcadia, Calif. This shows the extreme in the direction of the orchid-flowering *Amaryllis*. Next year the other extreme will be pictured on the cover, the regular-flowered *Amaryllis leopoldii* which has been rediscovered by Dr. Cardenas of Cochabamba, Bolivia.

This issue is dedicated to Robert Daly Goedert of Jacksonville, Florida, who received the 1965 William Herbert Medal in recognition of his outstanding contributions toward the advancement of *Amaryllis* culture. He is a commercial dealer in *Amaryllis*, and other amaryllids, of the highest stature. He stands for the highest quality in registered named *Amaryllis* clones, encourages the breeding of new kinds of hybrids by the introduction of new species even when these represent a financial loss to him. He has introduced two large quantity lots of seeds of the Blue Amaryllis, *Worsleya rayneri*, from Brasil, and a large number of lots of *Amaryllis* species collected for him in the wilds in South America. Some of these are bound to be of the same species, but species are often variable. It is worth while to have different lots of the same species in order to locate worth while varieties. The congratulations of all of the members go with the award of the Herbert Medal to Mr. Goedert, who presents a charming autobiography in the present issue.

The 1965 Amaryllis Year Book represents a rich harvest. The rediscovery of *Amaryllis leopoldii*, already indicated, will make it memorable in the annals of amaryllid history. In addition Dr. Cardenas describes three other new *Amaryllis* species. Mr. Goedert contributes an extensive summary of the 1965 *Amaryllis* season. Mr. Buck writes about *Amaryllis cybister*. Mr. Boshoff-Mostert describes vegetative propagation of *Amaryllis* for the amateur, and the professional grower. Mr. Frank A. Turner, a 7th grader, describes his science project concerned with *Amaryllis* propagation. Mrs. McCown reports on hybrid *Amaryllis* for desert regions. Mr. Caldwell writes about the control of *Amaryllis* pests, and Mr. Campbell on leaf disease control. The 1964 regional *Amaryllis* Shows are briefly reviewed.

The other amaryllids are not neglected. Mr. Hannibal writes about the crinums and other amaryllids of Australia and the Pacific Islands; and Dr. Zorbach reports on outdoor *Crinum* culture in Maryland. Mr. Hoerl contributes notes on *Haemanthus katherinae*. Mrs. Herold and Mr. Cloudette report on seedling development in the Blue Amaryllis. Dr. Rueppel in Argentina writes about amaryllid culture in his country. Mr. Caldwell contributes further notes on *Lycoris* breeding. Drs. Smith & Flory present a paper on the chromosomes of *Tulbaghia;* and Prof. Wilsenach reports on the chromosomes of five South African amaryllids. Dr. Howard contributes articles on the Blue Western Star, *Androstephium caeruleum*, and the genus *Nothoscordum*. Mr. Buck writes about *Hymenocallis fragrans*, and Daylilies in 1964. Dr. Howard reviews

his collecting trip into Mexico and Guatemala. There are still other articles as shown in the table of contents.

Hamilton P. Traub
Harold N. Moldenke

November, 28. 1964,
La Jolla, California

PLANT LIFE LIBRARY—continued from page [x].

GENERIC NAMES OF ORCHIDS, by R. E. Schultes and A. S. Pease. Academic Press, 111 5th Av., New York, N. Y. 10003. 1963. Pp. 331. Illus. $12.00. This new book by two outstanding authorities on the origin and meaning of generic names of orchids will be welcomed by all who are interested in these plants. In the introduction the grouping of the orchids is considered on the historical basis; the importance of a stable nomenclature is emphasized, and the morphology and economic importance is discussed. The main part of the book consists of an adequately illustrated dictionary which explains the etymological history of the 1250 generic names of the *Orchidaceae;* the geographical distribution and tribal or subtribal grouping of the genera; and the place of first publication of the names. The scientific names of orchid generic hybrids are listed in the appendix. This book is indispensable to all who are interested in orchids. Highly recommended.

THE CHEMICAL ORIGIN OF LIFE, by A. I. Oparin. Trans. by Ann Synge. Chas. C. Thomas, Publ., 301-327 E. Lawrence Av., Springfield, Ill. 1964. Pp. 124. Illus. $6.75. Dr. Oparin is the pioneer in the field covered by this book, having published on this subject as early as 1924. His earlier text has gone through a number of revised editions. Now, 40 years later, he presents his ideas clearly and concisely in the light of recent developments in this field. He discusses three stages in the evolution of organic substances which preceded the appearance of life on earth—the initial stages in the evolution of carbon compounds; the formation of "primaeval broth"; and the origin of the earliest organisms. He then considers further evolution of the earliest organisms. This is required reading for all interested in biology. Highly recommended.

THE LIFE OF PLANTS, by E. J. H. Corner. World Publ. Co., 2231 W. 110th St., Cleveland 2, Ohio. 1964. Pp. 315. Illus. $12.50. This gifted author is to be congratulated in presenting a refreshing new book on the bioevolutionary course for plants and fungi. He traces their development from free cells in the ocean; to the attached vegetation of the sea; to a partial migration to the shore; and finally to the forest, grassland and desert vegetation. Such a charming and unconventional book could not be used as a main text in phytology and mycology, but *should be designated as required reading* for students to supplement the text for the regular biology course. Highly recommended to all others who are interested in plants and fungi.

PLANTS IN PERSPECTIVE; A LABORATORY MANUAL OF MODERN BIOLOGY, by E. H. Newcomb, G. C. Gerloff, and W. F. Whittingham. W. H. Freeman & Co., 660 Market St., San Francisco 4, Calif. 1964. Pp. 218. Illus. $3.75. The objective of the authors in this introductory course in phytology is to utilize recent advances in biology in order to obtain a more unified treatment of the subject, including the basic properties and principles relating to plant life, and with emphasis on experimentation. The topics covered are adaptability of life; some basic laboratory tools; properties of living substance; reproduction and inheritance of variation; growth, differentiation and morphogenesis; factors in growth and development; and bioevolution. Highly recommended.

PLANT LIFE LIBRARY—continued on page 38.

Dedicated to
Robert Daly Goedert

Herbert Medalist—Robert Daly Goedert

ROBERT DALY GOEDERT

AN AUTOBIOGRAPHY

I can't remember when I was not interested in flowers. Of course there must have been some short period in my early life before they began to fascinate me. I do remember as a small boy gathering wild flowers that grew in abundance in the woods near my home. My favorite wild flowers were the violet and sweet bay (swamp magnolia). I also remember picking great armfuls of native *Zephyranthes atamasco* which we as children called "Easter Lilies."

The first seed I remember planting was a packet of pansies. This was when I was about 9 years old. I believe every seed came up and eventually I set out some hundred or so plants. They were a blotched variety and I thought they were about the most beautiful things in the world. I was very proud of them and have loved pansies ever since. After this first experience my interest in flowers has never waned.

My father loved flowers and as long as I was at home he purchased seeds and bulbs each year which I planted or helped to plant. Of course as I remember it, I did the work. The arrangement was one from which, I am sure, I got the greater enjoyment. I felt that each flower that bloomed was something I had created. I know my father encouraged me and is partly responsible for the fact that my interest in flowers has always been very strong.

I think my interest in flowers through the years had run a complete cycle until some eight years ago when I made *Amaryllis* my main interest. *Amaryllis* had always interested me. My father had a bed of the Mead strain hybrids he had collected by purchasing a few each spring when they were in flower. After the old home place was sold, some years back, I obtained permission to pollinate the *Amaryllis* that had been left. From these I raised several hundred very nice hybrids and flowered them for a number of years. Each year my interest in *Amaryllis* grew and I wanted to improve the collection. Finding few sources in the United States where the finer clones could be purchased, I started importing a few each year from Holland; first for myself and then for friends. Finally about 8 years ago I decided to try advertising and selling to others. While this experience has been interesting it has not been profitable for the problems of the *Amaryllis* bulb dealer are many and very trying.

I have accumulated a sizeable collection of *Amaryllis;* hybrids and species, and in future years hope to spend more time hybridizing new types.

On December 10, 1912, I was born in Nashville, Tennessee, where my father was working as a salesman for the East Tennessee Meat Packing Company. He had met my mother in Blue Ridge, Georgia where she was working as a bookkeeper, I was to return there some 20 years later to meet my wife. My father was born in Iowa and had come south

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as a young man. My mother was born near Murphy, North Carolina in a small farming community called Peachtree.

I was the second son of six children, four boys and two girls. My older brother to whom I was very attached was drowned on a fishing trip when he was seventeen and I, only fifteen.

The first years of my life were spent between Nashville and Murphy, North Carolina, where my mother spent several months with her family each year. We moved from there to Jacksonville, Florida where my father had obtained a job. My father eventually became a partner in one of the largest meat packing plants in Florida and finally owner.

My home has been made in Jacksonville, Florida, except for brief periods, ever since. Once during the First World War we moved to Houston, Texas; then to Green Bay, Wisconsin, and then to St. Paul-Minnesota; finally returning to Jacksonville, all within a period of a few years.

I attended elementary and high school in Jacksonville going on to the University of Florida to study Chemical Engineering. During my youth I suffered greatly from headaches. They were particularly bad during my college days. This, together with the disappointments of the depression years in the 1930's when many college graduates were having to take common labor jobs, was possibly responsible for the fact that I dropped out of school after a year and a half. I worked for my father in the meat packing business for a short while. Then, wanting to get out on my own and prove my self, (always a strong urge within me) I went to North Carolina where my mother's people lived. An uncle got me a job as a brush cutter in a survey party doing land surveys for the United States Forest Service.

My love for the mountains and the beautiful flowers that grow in them made this a very pleasant time in my life. However, there was a vacancy in the office for a computer. Since mathematics is a very easy subject for me, I was able to obtain the job in the office at Blue Ridge, Georgia, where I did geodetic calculations and drafting.

That fall when school started, as in all small towns, several young out of town teachers came for the school year. I started dating one of the teachers, Miss Cathryn Highnote of Richland, Georgia. We were married in the spring of the next year.

I was soon transferred to the main office of the Chattahoochee National Forest in Gainesville, Georgia. That year, 1936, our first son was born. After about a year, the land purchasing program of the Forest Service was reduced and my work was terminated. I returned to Jacksonville, to work several months for my father.

In November 1937, I took a job with the Bureau of Public Roads doing Engineering work on the Natchez Trace Parkway. First I worked in the office in Jackson, Mississippi; then as inspector at Ridgeland and Kosciusko, Mississippi. Having a fondness for the outdoor life and particularly the mountains, which I dearly love, I returned to North Georgia when the Forest Service notified me they had an opening. When I was a small boy, my mother and we children spent several weeks each

summer at her family's farm in the mountains of North Carolina. I spent many hours wandering over the mountains picking flowers and berries. I fell in love with the mountains at an early age so it was a natural thing for me to return at the first chance.

However my return was to be for a very short time. The Second World War was brewing and many civilian departments of the U. S. Government were being curtailed. Funds ran out for the job I held so the Forest Service asked me to transfer to Raleigh, North Carolina. I found out that they were to lay off another man in order to make a place for me and therefore I declined the job and returned to Jacksonville where I again worked with my father doing plant maintenance and construction work. When the war did actually start, possibly wanting to do more for the war effort and attracted by the high salaries in the engineering field, I took a job with a company doing engineering work for the Army Engineers at Bases on the west coast of Florida. During 1942-43 I worked on the construction of a number of facilities from Panama City to Naples, Florida.

By this time we had three children, two daughters and one son. Being away from home over long periods of time proved very difficult so I quit my job and started looking for work where I could be with my family. In December of 1943, I went to work for the Engineering Division of the Public Works Department of the United States Naval Air Station, Jacksonville, Florida. At first I was a draftsman, then chief Civil Engineer and finally Director of the Engineering Division, a position I still hold.

When I returned to Jacksonville late in 1943 my father let me use some vacant lots he had to carry on my hobby and I settled down to pursue it with great determination. First I grew a lot of vegetables as well as numerous kinds of flowers. Each year I expanded my planting and each year I gave away great numbers of flowers. Eventually I started selling to the local florists.

My general interest in flowers began to turn to more specific interest. My father had always loved dahlias and during my childhood had almost every year planted several new clones. They are showy and very impressive and my interest in them grew. The vegetables I had grown gradually disappeared and many of the annuals. My dahlia collection grew until I had several hundred hybrid clones. I saved seeds each year and raised hundreds of seedlings, always saving a few of the best rootstocks. I maintained this large collection for several years and had some outstanding seedlings in rare colors. I kept my dahlia collection stored in bushel baskets in my garage in winter. One year early in the spring we had a sudden freeze and I lost practically my entire collection. My interest in them did continue for several years and I did have one fine clone introduced. This one is a small yellow miniature named 'Tropicana' which is still one of the better miniature yellows today.

Being discouraged after losing my dahlia collection my interest gradually turned to gladiolus. Beginning with a dozen or so of a few kinds my collection gradually grew until I had practically every named

clone then in commerce. I bought some acreage and seriously set about growing flowers for the local cut flower trade. After several years I had two acres under cultivation. About this time the Korean War started. The military had a rapid build up. I had to abandon my gladiolus in favor of my job and let several thousand dollars worth of bulbs grow up in weeds. During this time I worked 12 to 16 hours a day practically 7 days a week doing engineering for the Navy. I helped plan the Aircraft Carrier Base at Mayport and many airfields and other facilities in the north Florida area.

When the Korean War was over and things again returned to normal about all I had left in my flower garden were the *Amaryllis* I had planted from seed several years before. These flowered each year and I had selected some of the best to keep and disposed of the others. That winter I bought about $500 worth of the Dutch bulbs from Johnson Bros., in New Jersey. These impressed me very much so I crossed them with the Mead strain I had selected. When the crosses flowered they were very beautiful and my interest was spurred on. During this period I had started corresponding with many people seeking information regarding new and different clones and types of *Amaryllis*. Being one who always pursues a hobby in earnest I became seriously interested in this flower and I purchased bulbs from Holland, then India and other areas. At this time there were few United States companies that offered *Amaryllis* and those who did asked much higher prices than the Dutch firms. Partly as a public service since I had had such a hard time finding a source of named *Amaryllis*, and partly to work up something that I might turn into a livelihood when I retired, I decided to import and sell bulbs at the same price the Dutch companies offered them.

The first year I purchased possibly $1000 worth and sold them with little effort but as I remember it cost me between $500 and $1000 to sell them. The next year I increased the number I bought, and again sold them at what it cost me to buy them. Each year I have expanded my listing and usually at the end of the season I am poorer, more tired and possibly a little wiser. An *Amaryllis* bulb dealer's plight is one of frustration and hard work with little or no return for his effort except meeting and making some wonderful friends all over the world. Only the determination that I shall find a profitable method of marketing *Amaryllis* encourages me to continue. I have not found the solution but I do feel I have learned many things. I also feel *Amaryllis* have commercial possibilities and that they will become more popular in the future.

I have accumulated a very wonderful collection of *Amaryllis* hybrids and species. At present in the spring I am still busy with correspondence and orders and have little time to segregate my collection into types. I hope to arrange my work in the future so that I can give more attention to this and hybridizing.

I hope the effort I have made will be profitable to me in the satisfaction that I had some part in popularizing a wonderful plant, *Amaryllis*. I believe I have helped to make available better types and through

my advertising have introduced these bulbs to a number of flower lovers who had never seen these improved types.

I also hope that through my efforts in finding collectors in South America, I will have introduced new species and helped in verifying habitat information and in finding the extent and distribution of different species in the wild.

I am sure that at times my methods have been criticized. First to the scientific mind I may appear a little unorthodox. One might say I have introduced and sold species without proper identification and some of these species may be duplicates. To this I must answer that I believe I have obtained as many *Amaryllis* species from different habitats as almost anyone in the past few years. My customers often paid a considerable price for these; some bought as named species have turned out to be something else. I can assure you, in most cases, I have subsidized the cost of the species. I often have paid the collectors several times what I received for the bulbs. The important point is that these species have been introduced into the United States and almost all in sufficient quantities that they will play a part in future hybridizing. In addition, it should be explained that there is *variation within the species*, and collections from different localities will bring these to the *Amaryllis* breeder.

Last season, after listing *Worsleya rayneri* seed for several years, I had $50.00 in orders. I had been promised seed of this for several years. Each year my collector would promise to try to get the seed but each year he had failed to get anyone to collect them. Last season I told him to get the seed at my expense. This he did. It cost me several times the amount I got for the seed. This is the story of the *Amaryllis* dealer who desires to sell species from the wilds. I am very proud that I have been able to obtain between 25 and 50 different shipments of amaryllis species from South America. All have been numbered and I am sure they will all eventually be identified properly. I do obtain habitat data now on most shipments. At first it was a struggle just to get a collector interested but dollars overcame some of this problem. To obtain any large number of a single species one has to turn from the professional to the commercial collector. To instill in the commercial trader the fact that you want the truth about his collecting and habitat data one often has to accept bulbs at an exorbitant price. There is no bargaining for price in collecting species and one has to be a little at the mercy of the collector as far as expense is concerned if reliable information is expected.

I have tried in my dealings with the growers to establish the highest standards in grading to insure quality and that clones are labeled true to name. Improvement still needs to be made; however. I feel the American Amaryllis Society can be proud of the progress its officers have made in this area in the past few years, especially in getting new introductions registered. We must be tolerant and patient in our efforts to get all *Amaryllis* clones named and registered for one must

realize that the Dutch Growers control the market on these and only through their cooperation and honest desire to have the clones named will this be accomplished.

I predict that *Amaryllis* will increase in popularity in the future. But for this one must *not* only look to the collector and show enthusiast. We must develop new types for border planting, freer flowering types for the nursery and florist trade and above all satisfactory types for Mrs. Housewife who wants to flower a pot or so of these showy flowers each winter. Until we can cultivate her interest we will not have accomplished our goal. We must have small *Amaryllis*, dainty ones, many colors, and many forms to obtain the attention of Mrs. Housewife for she is the most important person in our lives today as well as being the one who spends most of the Nation's wealth.

CRINUMS AND OTHER AMARYLLIDS IN AUSTRALIA AND PACIFIC ISLES

L. S. Hannibal

A visit to the Plant Quarantine Station in San Francisco during 1943 when World War Two was at its peak was quite an experience as innumerable Crinums were awaiting clearances there to be sent on to friends or relatives of American Troops then in the Pacific Theater. Thus, when the writer took a three months trip down through Hawaii, Samoa, Fiji, New Zealand and Australia he had a fair inkling of the bulbs to be found along the way, but despite his anticipations there were several interesting surprises and discoveries.

The first turned up in Honolulu where we saw great quantities of what is locally accepted as *Crinum asiaticum*, but we soon noted that the scapes of all these plants were 40 or 50 inches in length and that numerous small offsets were tightly grouped about the rather commonly exposed aerial pseudo-stems. In our experiences *Crinum asiaticum* normally increases rather slowly by the parent bulb splitting into twin daughter bulbs, and scapes are seldom more than 36 inches or more in length. In contrast a number of these Hawaiian crinums were bearing flowers having beautiful wine purple shadings, and a portion of these latter had foliage showing various degrees of copper-red tones. A more than casual inquiry at the Bishop Museum disclosed that the crinums with the colored blossoms were known as "Queen Emma" *Crinum* or *Crinum amabile* from Sumatra, and that the white flowered plants were *C. asiaticum*. The latter part of this statement was accepted with cautious reservations as it was quite obvious that the entire Hawaiian *Crinum* population was identical in all morphological characters, except for the floral and foliage pigmentation factors, and normally color by itself does not justify a species separation. The possibility that a *Crinum amabile—asiaticum* hybrid population had developed in the early days and was the cause of this color behavior was duly considered, and may possibly be the explanation, but the bulk of the fea-

tures of all of the crinums are specifically those of *C. amabile*, including the white-flowered forms. And as we learned later similar white and pigmented bulbs are scattered throughout most of the islands of the Central and South Pacific. The Sydney and Adelaide botanical gardens had representative examples including the copper red foliage variant and these were marked as of Sumatra origin. The unfortunate feature is that we do not know if *C. amabile* shows these color variations in its native habitat, nor do we know the degree of variation within the species. However, evidence seems to point to a variable species.

In Florida *C. amabile* rarely sets seeds, but in Hawaii it sets great quantities. In the vicinity of Kaaawa (Pronounced Ka-a-a-wa) the plant is used as a roadside hedge along the highway, and innumerable escapes were seen in the fields. Rainfall in this particular area is about 150 inches yearly and temperatures range from 65 to 70°F. In most gardens it is rather apparent that the white-flowered or copper foliage forms have been selected for floral or foliage quality since many seedlings with inferior blossoms or color can be noted where the plants have run wild. It was noted that there was some pigmentation evident even in the white-flowered forms as some seed pods took on a purple hue while others did not, and it was also found that normally less than 10% of the copper red foliage forms reproduced true to color type when selfed. Many seedlings are of inferior color. All of the variations observed had foliage some five or six feet in height and normally the older bulbs had worked themselves out of the soil to such an extent that the long basal root stumps were supported on or above the soil by the massive root systems. Offsets at the base of the basal root stumps have to be removed periodically to prevent the parental bulbs from becoming a tangled mass of bulbs and foliage. A good example of both the pigment free, white-flowered bulbs and copper red foliage type are to be found in the Foster Gardens in Honolulu, or in the gardens at the Royal Hawaiian Hotel. Fig. 2 shows a typical bulb which has the offsets removed every six months.

Hymenocallis littoralis is also commonly found through Hawaii and the Pacific Isles. It too has become an escape in the vicinity of Haleiwa at the north end of Ohau. *Eucharis grandiflora* was noted in a few gardens and obviously quite a number of older *Amaryllis* species and trade type hybrids are scattered about. *Agapanthus africanus* was observed in some of the drier parts of the islands.

The stop at American Samoa was all too brief to do more than note some *C. amabile* growing near the shore in the vicinity of the airport. Fiji was far more profitable as two local *Crinum* forms had recently been planted in the gardens of the Mocombo Hotel at Nandi and one had a golden cast to the foliage. The color was accepted at first to be due to a phosphate deficiency, but we later learned that a golden foliage form of *C. pedunculatum* is known in the area, so the writer now regrets not having collected some seed. This bulb would be a welcome addition to frost free tropical gardens. The second form was quite similar to the first only that the foliage was a normal grass green. The

Fig. 2. The *Crinum amabile* cultivated in Hawaii, usually called *C. asiaticum* in error. Note the long aerial pseudo-stem extending down from the attachment area of the leaves. Offsets have to be removed often to prevent a large clump from forming. Photo by Mike Keesling.

bulbs had been planted rather deeply, thus the bulb shape and arrangement of the leaf base attachment could not be observed to determine if the plants were *C. amabile* or *C. pedunculatum* (*C. pedunculatum* has a large urn shaped bulb which pulls down into the mud. It is topped by a well sheathed neck which comes up to the surface of the ground. *Crinum amabile* has the basal root trunk, as described; otherwise the foliage is quite similar between the two species.)

Our first introduction to *C. pedunculatum* actually growing in the native state was along the Hunter River in N.S.W., Australia. This was some fifteen miles inland from New Castle. The bulbs were located in ditches and tidal flood areas over quite an extended area. Their foliage was three to four feet in length, relatively erect and quite heavy. A mature bulb may be some six or eight inches in diameter. They rarely produce offsets. Reproduction is essentially by seed which can be borne about by water. Hunter River is apparently the most southerly point for its natural range in New South Wales. A wider leaf form is described by John Weathers as native to North Queensland, and Redoute lists a Tahitian variation. William Morris has collected several related *Crinum* forms with narrower foliage from the Rockhampton and Pt. Mcquarrie areas. Thus this group needs further collection and study. The Hunter River form can endure light frosts, but a hard freeze will kill the bulb.

Crinum flaccidum is widely distributed throughout central New South Wales and northern South Australia. In general the bulbs grow in a heavy soil which becomes near boggy during the summer rainy season. They require a summer tropical storm to bring the bulbs into flowering. Winter frosts usually cut the foliage back but since the bulbs drive down 10 or 12 inches in heavy clay or 20 inches in sand they are quite untouched by harsh weather. Natural plantings were observed north of Quirindi, west of Coonamble and in several regions both west and east of Moree. In most instances *Calostemma luteum* was associated with *C. flaccidum* and was in flower at the same time. The latter bulbs drive down seven or eight inches into some very hard clay. Both *Calostemma* and *Crinum* are prolific seeders, but few seedling plants were observed. The wallabies often eat the foliage.

Crinum flaccidum was also observed growing along the bluffs above Mannum on the Murray River and in the Pichi-Richi pass on the west side of the Flinders Range. This last planting is quite unique as the blossoms are a deep creamy yellow. Rainfall normally occurs in South Australia in the winter, but both the Murray River and Pichi Richi beds were so located that the winter rains soaked into the soil between huge granite boulders in such a manner that the heavy clays were quite moist for the better part of the summer. These South Australian bulbs differ in some minor details in tepalseg and tepaltube length from the New South Wales forms mentioned above, but not with sufficient differences to justify a subspecific differentiation. The Quirindi form probably indicates the greatest degree of local group variation as some bulbs have rose-colored blossoms and others display relatively broad elliptical

tepalsegs. Selected clones have promise of being availabe for future breeding purposes, but the rank odor of the blossoms rather discourages the use of these plants in a small garden.

Several clones of Bidwell's variations of *Brunsvigia* x *parkeri* were in flower when we visited the Sydney Botanical Garden. This included Bradley's well known 'Hathor' along with an outstanding variable pink clone known as 'Superba'. The latter bulb is well worth introducing to California. Back in the 1935 issue of HERBERTIA George Cowlishaw reported that the first white flowered Bidwell hybrid had appeared about 1860 in a group of Bidwell's seedlings planted at the Macarthur estate in Camden, some twenty five miles south of Sydney. This well known estate still exists with much of the arboretum quite intact. It was here that Lady Parker as a girl crossed some bulbs, probably of Bidwell's stock, and produced *Brunsvigia* x *parkeri* forms. Presumably plant breeding was no secret to her as her grandfather, John Macarthur, who is well known in early Australian history, developed the Australian Merino Sheep, and her father James and uncle, William Macarthur, had spent years collecting and breeding a vast collection of agricultural and horticultural plants from Europe and America, and much of this work was carried out at Camden. We did not have the opportunity to examine the garden for any evidence of Bidwell's bulbs, but his hybrids are widely distributed throughout Sydney and Parramatta gardens. These can be distinguished by the typical radial umbel which contrasts quite distinctly with the compact phototropic umbel of *Brunsvigia rosea* and *B. major*. In fact very few pure *B. rosea* or *B. major* were to be seen and these were of a different wild form than the clones normally seen in California. It is quite probable that the heavy tropical type of summer rains in Sydney tend to rot species material unless it is grown in very well drained soil.

Adelaide had a vast number of *B.* x *parkeri* and *B. rosea* clones in many gardens, and as mentioned, the Adelaide Botanical Garden had an excellent collection of Crinum species, although most of the subtropical species were suffering from the dire want of more water.

Two forms of hybrid *Brunsvigia josephinae* turned up. The *gigas* form (See plate 14, Plant Life 1960, p.42) apparently develops its great size due to two extra chromosome fragments, whereas a second form grown in the Melbourne area and known to the cut flower trade as the 'Giant Nerine' has only 5% viable pollen. From the color of the blossoms and the uniformly short length of the pedicels this latter plant may be a cross with a Nerine. But irrespective of the missing parent, the plant does produce a beautiful umbel, and the bulbs must exist in the thousands in order to be able to supply the many florists in Sydney with such quantities of cut flowers in mid March.

No amaryllids are native to New Zealand and only a few *Crinum moorei*, *C. bulbispermum album* and *C.* x *powellii album* were to be seen. However, *Agapanthus* has been very popular; and during January *A. umbellatus*, *A. africanus* and *A. africanus albus* were to be noted in practically every yard. In a number of instances *Agapanthus*

have become escapes. At the Stevens 'Bastia Hill' gardens in Wanganui we saw several *Bomarea* species, including a spontaneous cross which occurred in the garden. This latter plant is one of the most vigorous bomareas ever observed and it is hoped that rootstock material or seeds can be obtanied in order to propagate the plant over here. I believe that Major Pam furnished Mr. Stevens with one of the parental plants.

One experience is well worth noting. If *Crinum amabile* is to be imported from Hawaii it is necessary to have the bulb cleared at the Agricultural Inspection Station in Honolulu. In order to avoid delay and a costly nematode examination of the roots it is only necessary to have the inspector cut off the roots and lower portion of the basal root trunk. The bulb, which contains the growing plate and trimmed foliage can then be classed as a 'Plant cutting'. The shortened basal stump will regenerate roots in sixty days or so by plunging the bulb into damp sand.

PLANT COLLECTING IN MEXICO AND GUATEMALA

T. M. Howard, *Texas*

For my third year in a row, I returned to Mexico in 1964 for a two weeks summer period of plant collecting and adventure. This time I also took a small peck at collecting in Guatemala as well. Some readers may recall that I first made such a trip in 1953 (See HERBERTIA 1954), but what they may not know is that I have been doing it almost ever since. I made notable collecting trips again in 1954, 1955, and 1957. There was a lull of five years until 1962 in which I devoted my efforts to establishing my livelihood as a small animal practitioner in the Veterinary Medical profession, during which time I managed to devote my gardening activities to plant breeding, with particular emphasis on *Zephyranthes*.

In 1962 I made several trips, driving as far as Oaxaca, in Southern Mexico. In 1963 I went much further, to both Yucatan and Chiapas, almost 150 miles from the Guatemala border. I was determined to explore new territories, as new highways became accessible. In this respect I have been more or less competing with Mr. and Mrs. Morris Clint in a friendly rivalry in searching for new plant material. Because of my five year period of idleness in the collecting of plants, I knew that I had a monumental lead to overcome and the task would not be an easy one. I had to explore in new territories and this meant traveling much greater distances. My last two trips have each covered an excess of 5000 miles.

For 1964 I chose to drive Westward to the Pacific coast and then turn Southward and drive down the coast to Tepic. From there I turned Eastward to Mexico City and then down to Acapulco. Returning Northward, I turned Eastward at Cuernavaca and then drove on down to Oaxaca and then Guatemala. I returned to Texas by way of Mexico City and the Central Highway. The trip took 16½ days.

along with two blown out tires, several flat tires, and the repair of a punctured oil pan. The last named was the result of driving for several hours in the rugged unpaved highways in Guatemala, after crossing the Mexican border. In spite of what you may have read, the Pan American highway, though now open, is a long way from being completed for comfortable vacationing. There are fine sections of paved highways in the Guatemala interior, but roads leading to its Mexican border can really rough up a car, especially during the rainy season.

I left San Antonio, Tex., on a Saturday afternoon, June 27, 1964, in company with Chris Abee, a teen-ager under my employment for several years. He was invaluable in helping me to keep records, and assisting in the digging and counting, as well as cleaning and labeling of the bulbs and plants that we dug. My trip was several weeks after an earlier trip in June made by Mr. and Mrs. Clint. She had informed me upon her return that she had been too early, since the rainy season had not yet really started, and that she felt I would be more successful because I was leaving at a later date. I must admit that I was pretty confident because past experiences had shown me that the first week in July was "prime time" for collecting in Mexico. Indeed the 4th of July Holiday season finds an abundance of rain in Mexico, and flowers in bloom everywhere.

The first afternoon and entire night were spent in entering Mexico and crossing the arid Coahuilan Desert. By early morning I was in the Eastern fringe of the State of Durango. I stopped to make my first plant check and dug a few bulbs of *Zephyranthes longifolia* with withered blooms and seed capsules. This proved to be the only *Zephyranthes* species that we found in the State of Durango, though there are said to be other related species from that state. We were seeking any and all bulbous material, and not confining ourselves to the Amaryllis family alone, and because of this, practically every stop was likely to have something of interest awaiting us. Nearly every region was to be represented by some member of *Oxalis*, *Milla*, *Sisyrinchium*, *Anthericum*, *Manfreda*, or a member of a bulbous irid allied to *Tigridia*. I shall refer to *Tigridia* and related genera as "Tigridioids", since many of them are still not completely classified.

Our second stop in Durango that morning yielded our first of endless *Anthericum* species of the Lily family to be found in Mexico and southward. This one had not yet come into flower, but it had narrow glaucous green leaves growing in a rosette, and the usual fleshy roots. Not a momentous collection to be sure, but I felt that our luck was warming along with the rising sun. A few miles Westward on Highway 40, I stopped again to dig a few *Oxalis*, some corms of the ubiquitous *Milla biflora*, and an equally widespread little yellow flowered *Sisyrinchium* species with tuberous roots. Both this *Milla* and *Sisyrinchium* or other related species within their respective genera were to be found nearly everywhere that we went in Mexico.

My first major collection for that morning occurred a little later that Sunday morning at Kilometer 860, when I spotted a really beau-

tiful white *Anthericum* species flowering alongside the highway. It was a showy plant of large proportions, with its broad glaucous leaves and sparkling white flowers on stems 1-3 feet high. We dug a number of these plants since it seemed that here might be an *Anthericum* with better-than-average garden value. Our biggest surprise came later that morning as we were about 30 miles East of the city of Durango. There at K 921 we found our first amaryllids, a species of *Hymenocallis* new to me. The recent rains had brought them out of their dormancy and they were in full bloom along the roadsides and adjacent fields in open areas in heavy black soil. I have not yet identified this *Hymenocallis* and it may well prove to be a new species. I had not expected to find any *Hymenocallis* until we reached the Pacific coastal areas, and this one took me completely unawares. I thought perhaps that it might be either *H. sonoriensis* or *H. horsmanii*, since I had seen neither, but if so, it was too far southeast for the former and too far northeast for the latter. I was to learn later that it was neither. This species had 4-6 shiny upright green leaves about an inch wide, of rather compact size, and showy white flowers of typical *Hymenocallis* form. The staminal cup was of good size with rounded "teeth" between the filaments, which made it appear that someone might have done the art work with a pair of scissors. It seemed to lean towards the "Mexicana Alliance" within the genus, but it lacked the dull glaucous leaves which typifies so many species of that group. There were about six flowers per scape, and casually, from a distance, it reminded me a good bit of our native *H. liriosme* from Texas and Louisiana. A closeup inspection proved that this was not the case. Like other members of the Mexicana Alliance, this species produces nearly all its leaves at one time, and remaining green until the end of the growing season, the rainy season. Though it grew in fairly low and flat terrain of the plateau, the ones that we saw for the next few miles could not be called swamp or river bottom plants, though they grew in fairly wet grounds which likely stayed wet for a time after rains. The altitude in which they grew was slightly over 6000 feet elevation. From a gardeners viewpoint, this Durango species is a very pleasing addition to the group. A compact plant slightly over a foot high, it has flowers that are average or better in size of staminal cup, and tidy habits. It differs from *H. sonoriensis* in having longer, wider leaves, and a much larger staminal cup. It is probably larger in other dimensions as well. It does not have the glaucous leaves of *H. horsmanii*, and its foliage is more upright, longer, and more swordshaped. The flowers are larger too, with a larger staminal cup.

After passing through the city of Durango, we climbed into pine forested mountain country and stopped several times to collect several small species of *Oxalis* growing in open areas. One was a plain little lavender-pink species, while another was a compact growing yellow species with thick carrot-like root. The latter reminded me of a little weedy oxalis with small yellow flowers that plagues my bulb beds, but this one had larger, handsomer blooms, and of course, those weird finger

like tuberous roots, orange brown in color. I decided that it had garden value and dug a few. I only hope that it minds its manners under cultivation.

I was still purring over my good fortune in the new *Hymenocallis* East of Durango, when I rounded a mountain curve and spotted another surprise growing above the road. Seeing a flash of red, my first thought was that I had found *Bravoa geminiflora*, a cousin of the common garden Tuberose, in flower. Instead, it proved to be a lovely *Sprekelia* growing in a little colony on this mountain side. We found several more in flower and dug a collection of them. Undoubtedly this was a form of *S. formosissima*, and the medium sized flowers were rather typical of others of that quite variable species that I have found in other areas of Mexico. What intrigued me was finding it in Durango. I had found it much farther south and east, but did not suspect that it grew this far west and north in Mexico. Such is the curse of ignorance. I was later to learn that it extends even farther north, into the state of Chihuahua. But for now, the finding of it was a thrill. Even Chris, who is no flower lover, was impressed with the classic orchid-like form of this red amaryllid.

Shortly after noon, continuing westward, I found my first bulb irid, the beautiful *Tigridia dugesii* flowering in a clearing in a wooded area high in the mountains. This little *Tigridia* is a member of a large, but little known group of species within the genus that grows over a large part of Mexico. Those accustomed only to the popular *Tigridia pavonia* garden hybrids will scarcely recognize these little wildlings as tigridias, as they are much smaller, shorter, and daintier. This species, *T. dugesii*, was later identified by my friend, Elwood Molseed, a student at the University of California who is doing graduate work on the Mexican tigridioids. Thanks to his efforts, a lot of mystery of this group is being cleared up. This particular species has bright golden-yellow flowers, speckled in the center with tiny dots, but in typical *Tigridia* fashion, on 6-10″ stems. After flowering, they grow vigorously for a while until they become dormant. *T. dugesii* and its close allies flower in advance of their foliage, producing but a leaf or two along with the blooms, and then more leaves later. I had been using my camera all morning, and I took full advantage of it in thoroughly photographing the beauty of this little irid. I could not wait to see the color slides later on after my return.

A bit later, we made another collection stop in the mountains to dig other odds and ends in the bulbous line. Alas, I could not begin to identify all of them, as most were not in flower. At one notable spot, I stopped to dig leafy things that appeared to be of the genus *Manfreda*. With them grew other "things" with fleshy tuberous roots and wide deep green leaves growing in a rosette. I had not the faintest inkling of what it might be, save that it was likely in the Lily family, and distantly akin to *Anthericum*. We dug *Calochortus* here too. These are sometimes called *Cyclobothra* in Mexico, but I am not sure how they differ, if at all. The genus *Calochortus* is well represented and dis-

tributed throughout Mexico, but they are little known. Certainly I can't differentiate between them. Since they seem to flower later in the summer, I rarely find them in bloom, but often in leaf. Though widespread, they never seem to be common. Naturally we found a species of *Oxalis* at this spot, but more importantly, I found a very unusual tuberous rooted member of the genus *Tradescantia* that seemed to have more appeal than practically all others of that group. Had I not seen the flowers, I would have never guessed that it was a member of that genus. Though the fleshy tuberous roots were not unusual, they were grossly more like those of *Anthericum* or *Sisyrinchium* than any tradescantias that I have seen. The narrow grassy leaves were not usual for that family either, nor was the stiff little wiry flower stem that rose about 10″ above the slender foliage. Only the small bright rose-purple flower pointed to the family characters. It was as if this little plant wished to pass itself off as a member of some other bulbous family member and was trying to do it from root to flower. It had almost succeeded. One might have perhaps guessed it to be a dainty terrestrial orchid. I dug a few of these and they seem to be growing happily now. This is one jewel that I hope to propagate and introduce for distribution.

At another spot, high in a magnificent mountain valley, with bright green meadows surrounded by forests, I dug what I supposed might be a species of *Bravoa*, but since it was not yet showing any signs of flowering, I could only guess. These grew in filtered shade under trees along with a species of terrestrial orchid. I dug some of these "bravoaoids" and paused to soak in this fantastically beautiful alpine country. Flowers were in bloom everywhere and the sight was breathtaking. Everything was cool and green and springlike. It did not take much imagination for me to believe myself transposed to some valley in Switzerland in early summer. Very shortly afterwards in this early afternoon I found my second *Tigridia, T. violacea* flowering along a roadside ditch, many of them standing in water. They were a good deal like the yellow *T. dugesii* we had found a few hours earlier, but these were in many shades of violet, grew in clumps rather than singly, and seemed to have more flowers and buds per scape. Some were nearly white with shadings of palest blue-violet. Others were deeper in hue approaching light purple. We had to remove our shoes and socks and roll up our trousers to dig these out of the mucky clay. We washed these on the spot and placed them in plastic bags so that dehydration would be checked. I found that these plastic bags were indispensable in preserving living material.

That gorgeous afternoon was not to last though, and neither was our plant collecting luck. Before long it began to grow cloudy and then foggy and damp. Though late in June, the cold air of the high altitude forced us to roll our windows up and turn on our car heater. We were beginning to cross the "hump" of the high Western Sierras, and rainy mist and fog dampened our high spirits. The day was getting on, it was wet and cold, we hoped to reach Mazatlan before nightfall,

so we did not make any more stops. I did not see any plants, while driving, that interested me anyway, just forests of pine trees and other deciduous hardwoods. There were no towns, only occasional villages, and tiny ones at that. We did not find any place that we had cared to eat in, so we had skipped lunch. The promise of a seafood supper in Mazatlan spurred me on. As we raced westward towards our Pacific goal, we did begin to drop slightly in altitude and began to see bromeliads growing in the trees in these mountains. The only ones that I recognized were *Tillandsia* species that grow best at high altitudes. I was surprised to find one of these to be *T. prodigiosa*, an epiphytic beauty that I had previously seen only near San Cristobal de las Casas, Chiapas, in the southern tip of Mexico, about a thousand miles to the southeast. The long red colored influorescence lolled over the side of the plants and hung downward below the base of them like red ribbons. We began to drop more in elevation and began seeing more and more *Tillandsia* species and other bromeliads, many of which were terrestrial kinds. Long snaky *Cactus* hung above the roadside against the mountains with brilliant red flowers. I could not identify them nor did I wish to risk my limbs to attempt collecting them. We continued our dizzying descent and the mountain curves seemed endless. I have driven in mountains all over mountainous Mexico . . . thousands of miles of them . . . but this was ridiculous! Mountain after mountain after mountain seemed to extend outward in every direction seemingly to the ends of the earth. It was one continuing curve after another and we wondered if there really was such a place as Mazatlan. I knew that I had not completely lost contact with the rest of the world when I saw a road marker proclaiming that I had crossed into the State of Sinaloa. Our spirits began to rise. But the mountains continued to be as monotonously countless as ever. We had dropped a bit more in altitude. It was not cold anymore, and it was noticeably dryer, though the country had obviously had the beginnings of summer rainfall. I had given up any hopes of finding any more plants for this day. There were only a few hours of daylight left, and we wanted to get to Mazatlan before dark. But the biggest surprise was yet to come.

Hurtling around a mountain curve I saw a spectacle that really fired up my adrenalin into overdrive. There before my eyes was an entire mountainside carpeted with a tremendous colony of a startling *Hymenocallis* species in full flower. I stopped my car and jumped out, and was surprised to find the air heavily perfumed with the fragrance of the thousands of *Hymenocallis* flowers. They grew under trees and shrubs, and in the open clearings as well, showing that they were indifferent to sun or shade. This in spite of the fact that they had startling petioled leaves of bright green, which reminded me of a *Eucharis*. Each flowering plant had four broad leaf blades arranged in a whorl above the petioles. Towering above these leaves was an umbel of pretty white flowers of typical *Hymenocallis* form. I kept my camera busily clicking, taking shots of entire colonies, groups, individuals and closeups. Setting my camera and camera bag containing various lenses and

attachments on a silver painted roadside post. I set upon the task of digging bulbs. I was surprised to find that there was no evidence of a single offset on any of the bulbs that we saw or dug, and the bulbs themselves were quite small in size for *Hymenocallis*, about the size of a ping pong ball. Apparently this species increases very successfully by seeds alone, judging by the size of the colonies. This plant proved to be an enigma. Outwardly it would seem to fit into the *Speciosa* alliance as outlined by Dr. Traub, since it has broad thin foliage with distinct petioles as seen in *H. speciosa* and other members of that alliance. But the growth habits and also the flowers seem to lean more strongly toward the *Mexicana* Alliance. Like the other members of the *Mexicana* Alliance, this new petioled species lies dormant until the rainy season starts, produces all of its leaves at one time simultaneously with the flowers, grows for a short period and then becomes dormant at the end of the summer. Casually the flowers resemble those of *H. horsmanii* and *H. repanda*. Only study will reveal if it belongs in the Speciosa Alliance, or is an offshoot of the Mexicana Alliance, mimicking the former in its foliage. Certainly it is a most distinct plant and not likely to be confused with any other.

Thus Sunday, the 28th of June, 1964, was a red letter day for *Hymenocallis*. I had found two very distinct species that were new to me, and perhaps even new to science. I was very happy as I drove into Mazatlan. I had quite a collection of choice plant material, and I had made Mazatlan before dark. After leaving our collecting spot, I had seen this petioled species by the thousands in huge colonies on mountainside after mountainside, until we dropped to a lower and dryer elevation. After that we did not see them anymore. The country around Mazatlan and southward down to the Sinaloan coast was still bone dry. The rains were late. There were no bulbs to collect anywhere or much of anything else for that matter. This Monday was not my day. Too many tequila cocktails the night before had given me a horrible hangover. I don't know if the many changes in altitude had helped make me sick, but it was a blue Monday. I did not feel up to driving until almost noon. I let Chris do it. When I finally felt up to taking the wheel, we had a blowout! My spare tire was no spring chicken either. I now had no spare. I held my breath and crossed my fingers.

We crossed into the State of Navarit, but it was still too dry to collect. As we neared the City of Tepic, things began to green up, evidence of recent rains, and we were gradually gaining altitude. I stopped to photograph a pretty coral *Stenorynchus* species, a terrestrial orchid, in flower and it was then that I discovered the loss of my camera containing all of the valuable pictures taken to record the events of the day before. I wondered if that camera (with accessories) was still resting on that silver roadside post by the *Hymenocallis* colony with the petioled leaves. A speedometer check revealed that I was now about 300 miles from that spot and the chances of retrieving the camera were too small and would throw the entire trip out of kilter. I had a spare

camera, but no closeup lenses, and I had lost film that was even more valuable to me at the time than the camera itself. I still wonder just WHO found that camera and what they did with it? If they went to the trouble to process that color film, I'll bet they were surprised to see all the flower pictures. Certainly I had left my camera in a very accessible spot. I was really in a grim mood now, and only something surprising could elevate my spirits. Luckily that was not long in coming.

A roadside stop check in this hilly country revealed a variety of bulbous things. A narrow leaved glaucous *Hymenocallis*, not yet in flower, *Oxalis*, Anthericums, Manfredas, Besseras, *Cipura palludosa*, a pretty early morning flowering tigridioid, *Hypoxis* species, and a plant that looked like a *Crinum* in leaf, but that had fleshy tuberous roots. None of these were yet in flower, but it was obvious that we had again hit "pay dirt". These were dug at K 927, and I was thankful to again be on a highway that had kilometer markers. The highway of the previous day had been poorly marked and I had been at a loss to record my collecting sites. A few more miles southward, at K 892 I found *Hymenocallis horsmanii* in full bloom. This was my first experience with this species. They grew in profusion on the hillsides. I stopped to dig these and found to my surprise that a second *Hymenocallis* species grew along with them so that sometimes mixed colonies of two species could be found growing together. Only *H. horsmanii* was in flower, while the other showed no evidence of buds showing. The foliage of *H. horsmanii* was considerably broader, especially broader at the middle of its length, and the leaves were more lax and lay close to the ground. Bulbs of *H. horsmanii* were smaller, and it was not unusual to find one flowering with a single flowered scape from a bulb less than an inch in diameter! The other species, which had been tentatively identified as *H. repanda*, had narrower, more upright foliage, larger and deeper-seated bulbs. The foliage was more numerous and they flowered later. This was demonstrated by dissecting several bulbs and removing the embryonic buds which were already deep in the neck of the bulbs. Upon returning from my trip, I planted bulbs of *H. repanda* and a few of these flowered in late July and early August. The flowers differed slightly in form from *H. horsmanii*, and this came as no surprise.

Hymenocallis repanda has been kicked about over the years. My opinion is that earlier botanists, for the most part, failed to see that there were two separate species growing in the Tepic area, since they grow together and both have glaucous foliage. The fact that they flower a month apart was likely overlooked. A botanist working such an area one month is not necessarily going to comb the same area several weeks later. He may move on to other territory. Also the fact that *Hymenocallis* are still flowering a month later may not necessarily seem unusual to him. He may assume that they do not all flower at once and that they flower over a long season. Not all taxonomists pay as much attention to leaves as they do to flowers. The few taxonomists that did take note of *H. repanda* were rewarded by having it thrown into synonymy

with *H. Horsmanii*. I earnestly hope that this little mystery can be settled once and for all with a study of collected specimens.

Nearing the Northern limits of the city of Tepic, I spotted a flash of pink along the roadside and I stopped to investigate. Beneath my feet were a large colony of a remarkably showy white *Tigridia* species, *T. passiflora* (Molseed). The flowers were similar in form, but larger than either *T. dugesii* or *T. violacea* that I had seen the day before in the State of Durango. Growing with them were scattered colonies of a pretty pink flowered *Zephyranthes* species. These were our first *Zephranthes* since we had collected *Z. longifolia* the morning of the previous day. Many of these *Zephyranthes* flowered from bulbs only ¼-½″ in diameter. The flowers were of medium-small size and showed very little color or form variation. All had moderately long, narrowish segments, and shiny green leaves. Though pretty and dainty, they seemed rather less distinguished than other *Zephyranthes* that I have collected in Mexico. The following day I was to again find this species growing just east of Guadalajara in the state of Jalisco.

We ate a late lunch at Tepic and then proceeded towards Guadalajara, where I hoped to spend the night. A few minutes after leaving Tepic, we encountered a heavy downpour of rain, but in a matter of minutes we had passed through it and were in sunshine again. I stopped to check and collect a few more bulbs of *Tigridia passiflora* at K 869. This turned out to be another wonderland of bulbous material, and we made the most of it. There were white anthericums, *Milla biflora*, *Bessera* sp., and some large Manfreda-like plants. The Bessera were not yet in bloom, but many of the buds were beginning to show some red coloring. Mrs. Clint had collected both red and violet colored *Bessera* the year before in full flower and had sent me a few of the violet forms. I had flowered one of these before leaving on this trip, and it was obviously different from *Bessera elegans* that I had collected in 1957 in the State of Guerrero. Mrs. Clint had assumed that the red ones that she collected in Nayarit were *B. elegans*, and that the violet ones were something else. It now appears that both the red and violet forms are both color varieties of a single species, but neither of them is the same as *B. elegans* that grows in the state of Guerrero. The latter has coral-red flowers with broader segs. It is more robust, and I have never seen any color variation in it. Even the pollen of these two species differs in color. The red variations in the Nayarit *Bessera* are carmine-red rather than coral-red. More study will be needed to determine if they really are two separate species, but meanwhile gardeners can rejoice in the addition of new color shades to this charming genus.

Continuing eastward on Highway 15, I spotted a large pure colony of *Hymenocallis* in leaf at K 859. The foliage was upright, narrow, and glaucous, and the plants fairly compact. No plants were yet showing any evidence of flowering, though the bulbs were of moderate size. I dissected a few of these bulbs to find that they would be in flower in another few weeks. I am inclined to think that these bulbs were the same species that grew with *H. Horsmanii* North of Tepic, the only diff-

erence being that these seemed to be a bit more robust, perhaps due to better growing conditions.

Entering the State of Jalisco, I stopped to collect an unusually showy large flowered oxalis with dark rose-pink flowers and robust habit. Indeed it is the prettiest *Oxalis* that I have seen of this type, the flowers reminding one of *O. bowieana*. The bulbs of this species were huge, by *Oxalis* standards, some being 2" in diameter, and growing to a depth of six inches, which made them rather hard to dig without injuring them. The giant leaves were slightly hairy. I have not yet identified this one, but have a hunch that this is likely one that has likely been in cultivation for some time.

Our last collection for that day came just before sundown, just outside the western outskirts of the little town of Magdalena, Jalisco. Some roadside *Hymenocallis* in flower caught my eye and I stopped to check. The rather narrowish swordlike leaves were a dark glaucous dull green and the plants were of medium size. I could not figure out just what this species might be. Certainly it was not *H. repanda*, nor was it Mrs. Clint's #658 (*H. Riparia*?) that grows both north and west of Jalisco. Once again only further study can reveal just where this species fits in. It may turn out to be a variation of Clint's #658, or perhaps another species. Though in flower, it was getting late and we were in a hurry. Rain clouds were building up and there was a storm in the offing. We did not really take the time to study the flower, but there seemed nothing unusual about it at casual glance. I did take enough time though to dig some odds-and-ends of bulbs that were growing along with these *Hymenocallis*. There were some *Hyporis* sp. with heavily reticulated tubers, a few small yellow *Anthericums* and a narrowleaved Bravoa-like little thing that is now a real "Whatzit" in my garden. Though I have not yet flowered it at this writing, I cannot for the life of me figure out what it might be. I am certain that it is akin to *Bravoa* and Tuberose, but that is all. This is one of the things that I really look forward to flowering someday.

By this time it was getting dark, so we drove on to Guadalajara, through rain, and spent the night there in an ultra cheap Hotel, complete with cockroaches. (We were trying to save money). The following morning after much shopping, I bought a used recap tire and tube, and we once more had a spare. It was a good thing too, our former "spare" was beginning to look pretty bald on the ground. It was only a matter of time . . . .

Leaving Guadalajara the following morning, we spotted pink *Zephyranthes* in flower, in an area midway between that City and Lake Chapala. These turned out to be the same species that we had collected just north of Tepic the day before, save that these were a bit more variable in shades of pink. I also found *Allium* species growing in wet spots in this area. These were not in flower, but I presumed it to be *A. glandulosum* or one of its allies. Here too grew a very showy rose colored *Oxalis* species of a very dwarf type, an unusual cream colored little tuberous rooted *Sisyrinchium*, and a violet purple *Tigridia* species.

A few miles closer to Lake Chapala we found another *Hymenocallis*, the old familiar species that Mrs. Clint had collected as #658 in 1955. These were growing in very wet places along the roadside and were in full bloom and growing in large clumps. I did not bother to dig any of these as I had a fair supply in my garden, but I was interested to find them in a new collecting site. Those of Mrs. Clint had come from 25 miles north of Guadalajara, while these grew nearly midway between that City and Lake Chapala. Some people feel that this species is *H. Riparia*. It is a handsome and tidy species, but to me rather undistinguished in flower.

Upon reaching Lake Chapala, I kept my eyes cocked for *Hymenocallis mexicana* (syn. *H. dillenii*) the #604 of Mrs. Clint's earlier collections, which she had found growing near the lake in June of 1955. Since we had always referred to it as her "Lake Chapala" species, I had assumed that it carpeted the area surrounding the lake. It was not until I approached the eastern limits of that Lake and the Michoacan state line that I finally caught a glimpse of a large colony growing among lava rock. These were as thick as thieves and I dug them out of the rocks until I was satisfied. They were in full bloom. It is a very dainty little thing and most distinct, with its unusual outward facing flowers with short curved tubes. Mrs. Clint has found her largest populations in Jalisco, and extending into the adjacent states. Certainly they are well represented in Michoacan as well with heavy populations, where they may be seen growing in abundance along the roadsides in the plateau country on the road to the city of Morelia. It seems to show little or no variation anywhere that I have seen it.

Later that day, at K 488 on Highway 15, we found a colony of pink flowered *Zephyranthes* growing with a large number of *Nothoscordum bivalve* and purple flowered *Tigridias*. We began digging bulbs of these here, but a sudden shower soaked us to our skins before we could finish. Gaining altitude in pine covered mountains, I looked for *Bravoa geminiflora* in flower, but did not find any bulbous plants of any kind. It was a very rainy afternoon and it was still raining when we pulled into Morelia that night. We were lucky in having bought a tire in Guadalajara for a spare that morning, as we had a flat in a small town just before arriving in Morelia. I had to delay leaving Morelia the following morning so that I could have the tire vulcanized and a tube placed in it. Tubeless tires are not yet in vogue in Mexico, and it is best to have tubes placed in any tubeless tires that become flat.

Leaving Morelia the next morning, we stopped just a short distance beyond the eastern limits of the city to trudge up a mountain side to check if there were any sprekelias. We did not find any, but we did find a small hairy leaved yellow *Anthericum*, and some unusually large flowered *Milla biflora*. *Zephyranthes* also grew along with them, but these had already flowered. Naturally it began to rain again as we dug, and we were about to give up, when it stopped as suddenly as it began. Still not content, we decided to walk still higher up the grass covered mountain side. It was a good thing that we did too, for at a higher level

I came upon a colony of *Bravoa geminiflora* in full flower. I had never before found such a large number of them in bloom, and the 2-3′ wiry stems with their pendent coral-red fire-cracker-like blooms were a most intriguing sight. Growing with them was a species of *Calochortus* showing buds, and a tiny little *Anthericum* species with white flowers and flat, shiny green leaves, pressed against the ground.

Driving a few more miles eastward, at K 282, I made a routine check stop by a wooded mountainside to see if I could find any *Sprekelia*. I walked along the roadside and followed a little trail but found nothing but a few *Calochortus*. I walked back to the car and got in and was just about to drive away when I glanced upward and saw a colony of *Sprekelia* in seed and leaf. The leaves of some were nearly three feet long. They had been right there over my head, but I had been looking elsewhere. These were the largest *Sprekelia* bulbs that I had ever seen. Growing with them were large iris-like plants with tuberous roots. These were undoubtedly the same giant yellow flowering *Sisyrinchiums* that we were to find in flower in Southern Mexico.

Continuing eastward, we stopped at K 222 to dig bulbs of a purple flowered *Tigridia*, the same one we had dug the day before in the rain. These grew in a huge colony along the highway in heavy soil, with many of them standing in water. A robust, but compact growing species, this one should grow well under cultivation. At this spot we found an armful of freshly picked *Bravoa geminiflora* lying on the ground. Apparently these had been pulled by children and then cast aside. One stem still had a bulb clinging to it, and I put this into a sack with our other Bravoas. It is strange how ruthless and wasteful people can be in expressing love for flowers.

Later in the afternoon, as we neared the city of Zitacuaro, at the eastern limits of the State of Michoacan, I stopped at a spot where I had collected in 1957. This was a corn field in which grew an interesting assortment of bulbs, including *Sprekelia*, *Allium*, *Sisyrinchium*, *Bomarea*, *Anthericum*, *Oxalis*, and a large colony of *Tigridia meleagris*. To the uninitiated, this *Tigridia* comes as quite a suprise, as it has very um-*Tigridia*-like flowers. The large pendent bronzy-purple flowers hang like large bells at the tips of the scape, much like a *Fritillaria*. The *Allium* species was not flowering, but it may likely have been *A. glandulosum*, a stoloniferous wine colored onion which is one of our Southernmost Alliums. The finding of a *Bomarea* species was an exciting event, though I was unable to keep the plant alive once I got this rare amaryllid home.

We spent the night in Toluca, state of Mexico, and of course it rained. We departed for Acapulco the following morning. Though less than an hour's drive from Mexico City, I decided to bypass the capital in order to save time. It was now Thursday, July the 2nd, and we still had much ground to cover. This highway, Highway 55, led to Taxco, the famous old colonial silver mining town, and I was later thankful that I chose to take this route as I found several new and interesting plants along the way. A few miles South of Toluca, at K 108, I stopped to dig

a few bulbs of a plant that resembled *Polianthes tuberosa*, the common Tuberose, and it was no doubt related to Tuberose and Bravoa, but since it was not flowering, I will have to wait until it does before I can identify it. These grew with stiffish leaves lightly speckled with purple at the base. I am still looking forward to collecting my first wild Tuberose in Mexico, as this plant is supposed to originate there but it seems to be unknown in the wild! A bit further south at K 138 we found many bulbs of *Tigridia meleagris* in full flower along the roadside, and in stopping to check, found another *Tigridia* species in seed growing with it, along with Sprekelias, *Milla biflora*, *Allium* sp., *Zephyranthes*, Anthericums, and Sisyrinchiums.

A few miles north of the City of Taxco, in the state of Guerrero, we found another important addition to our collection. My first impression was that perhaps we had found a Giant *Bessera*, as the stiff hollow leaves were 3-4 feet long and a dark bluish green. Closer examination showed old dried flower stalks of the previous year, and the very long angled pedicles and withered seed pods seemed to indicate that it was another *Milla* species or one of its allies. Though the old flower stalk indicated a *Milla*, the leaves were certainly Bessera-like. Apparently this new *Milla* has a restricted range, as we did not see it any more after passing through this area. We ate lunch in Taxco, and it was a strong temptation to linger in this old city with its quaint cobble stone streets. After leaving Taxco, we drove toward the city of Iguala, the Capital of Guerrero, and a junction with highway 95 which lead to Acapulco. We saw many bulbs of *Bessera elegans* flowering along the roadside. Apparently this is a disappearing species, since cattle eat it and it seems now to be found in rocky cliffs and other such places inaccessible to livestock. Little wonder that it has become a rare plant in cultivation lately.

North of Chilpancingo, Guerrero, I stopped to collect a few bulbous irids, and *Calochortus* but these were not yet in flower. I am certain that these irids are the same as those that I collected in 1957 in this same area and which flowered with large golden yellow flowers that looked very much like *Nemastylis* in form. As this area was grazed by livestock, they were to be found growing under dwarf palms and in rocks where they could not be easily eaten. About a mile further South, around the bend we found large colonies of *Hymenocallis glauca*, a few Sprekelias, and scattered plants of *Bessera elegans* in flower. Nearing Chilpancingo, I spotted scattered colonies of an old *Hymenocallis* friend, a species that I had first collected in 1957, my #57-8. This is a rather dwarf type with low, ground-hugging foliage, and few flowered umbels topped by long tubed flowers which have strongly "teethed" staminal cups. Though it grows in the same region with *H. glauca*, this species is never found growing with it, since *H. glauca* likes the mountains, and this species likes low wet places in the valleys. I noted that the Kilometer readings for this species were K 350, and K 317. A bit later in the day I made my last *Hymenocallis* collection for the day, in a roadside river bed. These were wedged between rocks in the river, and also grew on the river banks, but were not in flower. I would not be surprised if this is the

same Chilpancingo species, 57-8, since it grew in the same area at K 344, only six kilometers from my original 1957 collection. Bulbous plants seemed to play out as we approached Acapulco, and we decided to call it quits for that day.

Our 6th day was essentially a return up the same highway 95 from Acapulco to Cuernavaca, Morelos. Because this part of the trip was mainly a rerun, I did not anticipate finding anything new but overlooked from the previous day. As good fortune would have it, I was wrong, as usual. A "Ho Hum" check stop at K 216 in a semi-arid *Cactus* country where *Neobauxbaumia tetetzo* grows in profusion proved to be a bonanza. Growing beneath these columnar giants were numerous *Milla*-like plants with many thready leaves. They grew in profusion in the chalky soil of these dry hillsides. I first found a few dried flower stems and it was obvious that these were unlike ordinary Millias, and perhaps they might be something else. I then found a few of them in bloom and from a distance they resembled Alliums, but closer inspection revealed that some of the little white flowers had reflexed segments. The little corms were typical of the *Millinae* rather than the Brodiaeas; that is the tunics were membranous rather than fibrous. Were it not for this, I would suspect that perhaps they belonged to the genus *Muilla*. Perhaps they may be the long lost *Diphalangium graminifolium*. Only further study under cultivation will solve the riddle, but I am confident that we will know more about these little plants within a year or so. These were dug south of Iguala, Guerrero. Continuing a few more miles northward we found a white flowered bulbous irid, but I could not identify them since all flowers had closed by afternoon. I surmised that perhaps they might be either *Cipura* or *Eleutherine* species.

South of Cuernavaca, Morelos, I stopped to dig a few corms of a large white flowered form of *Milla biflora*, along with some purple-flowered Tigridias, and some orange yellow Antehricums with very slender leaves. I also dug a few *Manfreda*-like plants with purple spotted leaves. At Cuernavaca, I turned Eastward on Highway 115 towards Cuautla and a later junction with Highway 190, the southern leg of the Pan American Highway. Midway between Cuernavaca and Cuautla I stopped to check for evidence of *Hymenocallis graminifolia* which I had found in this area the two previous years. I have been particularly impressed with this very showy and very dwarf member of the Mexican *Hymenocallis* group and figured I could always use a few more. I found neither this *Hymenocallis* species, or the pretty white *Zephyranthes* species that grew with them, but I did find what may perhaps turn out to be another new *Milla* species or variety of *M. biflora*. It looked very much like the common species, save that this was a very dwarf plant with very short 6" stems bearing but one or two flowers. The foliage was very slender and thread-like. Once again, it will take further scrutiny to determine the status of this most distinctive and charming little *Milla*.

We reached our junction with the Pan American Highway at Izucar de Matamoros, in the state of Puebla and daylight was drawing nigh.

We then turned southward and made a final stop a few miles south of the little town to dig a few bulbs of *Hymenocallis glauca* and *Tigridia meleagris*. Both of these plants seem to be fairly widespread in south-central Mexico. I now have collected bulbs of *H. glauca* (Herb.) Baker ex Benth & Hook. in the states of Puebla, Oxaca, Mexico, Morelos, and Guerrero, and this is undoubtedly the same plant that Herbert named *Choretis glauca* in 1837. This name was later changed to *Hymenocallis glauca* by Baker in 1883, and then to *H. choretis* by Hemsley in 1884. It was still called *H. choretis* in Sealy's REVIEW of THE GENUS HYMENOCALLIS, but Sealy admitted that perhaps the name *glauca* might prove to be more correct. I am inclined to follow Herbert's nomenclature since this is probably the commonest, most distinctive and most widespread species of the Mexican Alliance and undoubtedly was one of the first of the Mexican species to catch the eye of and impress Mr. Herbert, so much so that he even proposed a separate genus for it.

Also in this same area in Southern Puebla, I recollected corms of another old friend, a very pretty night flowering *Milla* species with dark bluish green nearly glaucous rushlike foliage. I had previously collected this plant in 1962 and 1963 a few miles south of Tehuacan, Puebla, but Mrs. Clint had collected it several years before in the State of San Luis Potosi. Oddly, this is a stoloniferous plant as well as being only a night bloomer, two characters that easily separate it from *Milla biflora*. The flowers do not have the peculiar "scalloped" base to each segment as do *M. biflora*, and the green stripes on the backside of the segments is much more distinct. The fragrance is much more noticeable as well. I have not yet identified this species, but it is a welcome addition to this charming group.

We spent the night in Huajuapan de Leon, a small town in the northern part of the State of Oaxaca. This is a very charming peaceful little town, but the Mexican Army was called upon to put down an uprising only as recently as 1962! Early in the morning found us on the road again in hopes of reaching the city of Oxaca by noon for lunch and a day of much needed rest and relaxation. Just a mile or so outside of the city of Huajuapan I collected a little *Anthericum* species with white flower that I had also collected the year before. This little dwarf is very showy and has wonderful garden value, since it blooms each morning from early summer until late autumn. The low glaucous foliage is very tidy and it makes an excellent border plant. It may later develop that many of my Anthericums may turn out to be members of the genus *Chlorophytum*. I do not know enough about their taxonomy yet to classify any of them. Judging by the great number of species I am not at all certain if all of them are yet classified anyway. Surely there are enough of them to merit a lifetime of study. Growing with these little pretty white Anthericums was a sessile white-flowered little *Zephyranthes* that was likely a southern corm of *Z. verecunda*, the familiar little yellow *Sisyrinchium*, and an odd little wine colored afternoon flowering tigridioid. This latter may prove to be a species of *Tigridia* or perhaps a member of another related genus. At K 374 we encountered one of the more

spectacular *Sisyrinchium* species. This orange yellow species grew in the mountains south of Haujuapan and had flowers over an inch in diameter. Later that morning, while driving through a mist in the mountains, north of Yanhuitlan, Oxaca, I found yet another large flower *Sisyrinchium* which had pretty lemon yellow flowers and very narrow foliage. Strangely this species lacked the usual tuberous roots found in the other yellow species in Mexico, but instead had very thin fleshy roots too thick to be fibrous and too thin to be tuberous. This was one of the "oddballs" of our collection.

I was very eager to collect *Fosteria oxacana* (Molseed), a brand-spanking new genus of the tigridioid group, only recently recognized as late as 1963. I had collected this plant myself in 1963, but was unaware that it was unclassified until Mr. Molseed so informed me through correspondence. I found a large colony of them growing in a wooded mountainside at K 460. The small yellow flowers are more odd than showy and very different from anything else in this group. Growing with them was a species of *Schoenocaulen*, a little known member of the *Liliaceae* with plain greenish flowers. This one had peculiar heavily reticulated bulb coats. Later we collected more *Oxalis* species and another yellow *Anthericum*, but by this time I had lost count of the number of Anthericums I had encountered. Our last important collection for this 4th of July was an odd little bulbous irid from the mountains north of the Valley of Oaxaca at Siete Cabrillos, in the Cloud Forests where bromeliads were to be found in abundance in the trees. Surely not a *Tigridia* or anything else familiar to me in this interesting group, I was enchanted by its delicate charm and daintily fragile flowers which seemed to dance on their slender 10" stems. At a quick glance one might think the translucent white 1½" flowers were perhaps a species of *Tradescantia* in the Spiderwort family. Closer inspection showed that each bloom had three large showy segments with three tiny little inner segments, reduced to nearly bristles, which were blotched yellow and dotted with tiny purple spots. There were three long yellow stamens with a longer yellow stigma dangling to one side. The very narrow grassy leaves proved to be plicate on closer inspection . . . a characteristic of all tigridioids. There were sometimes two flowers open at one time per scape, and the bulbs seemed inclined to form offsets freely. As always, while collecting plants in Mexico, one is apt to draw curious natives to see what is being dug and this was no exception. Almost before I knew it, a man and his wife and their children were yanking handfuls of these irids and offering me bouquets. I thanked them, but explained that I was seeking only the bulbs and not the flowers. I later learned this little irid is *Sphenostigma conzatti*, a plant described by R. C. Foster in 1947 from material collected by Conzatti in 1907. Mr. Molseed tells me that my 1964 collection is likely the first time it has been collected or even seen since the original collection by Conzatti in 1907. It is easy to see why. This is a very early-morning flowering species and the flowers are usually gone before the suns first rays hit them. The fact that I was able to spot them was because the morning was unusually cold and

misty, no doubt keeping the flowers in fresh condition longer than usual. Also I was up and about earlier than usual that grey chilly morning.

Arriving in the city of Oaxaca, we ate lunch, found a Hotel and napped. After cleaning up and refreshed, we went shopping, and in doing so, found a shop where a Kinkajou was for sale. This pretty little animal is sometimes known as a Honey Bear, and they make delightful pets. I made a down payment on the little animal and told the shop keeper that I would pay the balance when I returned from Guatemala in a few days and would pick up the little animal then. The next day, July 5th was a fairly dull day for collecting. We had a long trip ahead of us, driving from the city of Oaxaca, Oax., to the highlands of San Cristobal de las Casas, Chiapas. Normally the trip averages ten hours of driving and our average was not helped at all by our second tire blow out and the necessity to purchase another tire. The fact that nearly all businesses were closed that day because of a National Presidential election did not make the purchase of a tire easy. I might add that my car was equipped with a tire size that was not manufactured in Mexico and it was very difficult to find a tire that would come close to fitting! We lost three hours in looking for a tire in Tehuantepec and Juchitan in the Tehauntepec Isthmus before we could continue on our way. I did manage to take time to stop and collect a few bromeliads, and was especially pleased to pick off a few plants of *Tillandsia Carlsoni* north of Tehauntepec earlier in the day. It was nearly dusk before I stopped at Ocozocoautla, Chiapas, to dig a few bulbs of a *Zephyranthes* that I had collected in the same place the year before. For some strange reason, *Zepyhranthes* seem to become as scarce as hen's teeth in Southern Mexico. Except for a few *Zephyranthes brazoxsensis* that are to be found around the city of Oaxaca, I have not found any members of this group until reaching this point in Chiapas. Oddly, this Chiapas *Zephyranthes* seems to be identical to *Z. miradorensis* found much further north and west in the state of Veracruz. Why it suddenly turns up again here is one of those enigmas that makes plant collecting interesting!

We reached Tuxtla Guterrez that evening, but chose not to stop, but rather proceeded onward and upward to the mountain city of San Cristobal de las Casas where we would spend the night. The distance is only about 50 miles, but it is a steady climb all the way. This beautiful country has all the charm of Guatemala. Native amerindians still cling to their regional costumes, the climate is invigorating and it is a paradise for plant collectors, particularly those seeking bromeliads. I decided that we would return from Guatemala through this town and made arrangements to leave all of my plants with a Hotel attendant, picking them up on my return. I would thus not risk losing them in crossing the frontier and customs inspections with which I was unfamiliar. I had originally intended leaving my plants in the city of Oaxaca and I was later to regret not doing this instead. I have never found much in the way of bulbs in the San Cristobal area, though it seems like it would be ideal for them. I will admit that I was amazed to see amerindian women carrying boquets of cut flowers to market

that included scapes of *Brunsvegia rosea* . . . and this in early July! The country is high and cool, and gets much summer rains and I did not expect to find Brunsvegias growing happily under such conditions.

We left San Cristobal, and drove towards the Guatemala border and did no more bulb collecting, though I stopped to admire some beautiful white flowered Calochortus of the "cat's ear" type in bloom. There is little reason to mention here all the details of our problems of crossing into Guatemala, other than to note that it can be costly unless one crosses during the limited time in which the border is officially open. The "extraordinary service charges" can make a dent in the day's budget. The roads leading from the border into the interior are horribly bad and unpaved, and are much worse during the rainy season. Naturally we arrived with the beginning of the rainy season, and I was well indoctrinated about the hazards of driving at this time before I had traveled more than an hour. The country is fantastically beautiful, but I failed to collect any bulbs while there other than a little stoloniferous *Milla* species. These were not in flower, but I later flowered them at home and they proved to be another night flowering species similar to the ones from the state of Puebla, Mexico. These differed in having slender, grassy leaves. We found these near Huehuetenango.

We lost time at Solola, near Lake Atitlan repairing a torn oil pan, and thus we decided to cut our trip short and return to Mexco by another route. This change in plans caused us more border delays and also more miles of driving than we had planned. The experience was a nightmare that I am in no hurry to repeat. At any rate, we finally *did* return to San Cristobal to pick up our plants and then drove northward to pick up our little Kinkajou in Oaxaca . . . sadder, poorer, and much, much wiser! In defense of Guatemala, I will say that the country is gorgeous, the people friendly, and prices more reasonable than we feared. My main complaints are the miserable highways leading into the country, and the hazardous conditions encountered. I am sure that someday this will be corrected. Highways in the interior are excellent. My other complaint is the absurd methods used to fleece tourists out of extra dollars with the many "extraordinary services" by employees of both governments. Tourists accustomed to crossing into Mexico from the United States will be rudely shocked when they try to return into Mexico from Guatemala. My advice is to fly.

The drive down from San Cristobal to Tuxtla Gutierrez proved to be pleasantly eventful and rewarding. We collected a few choice bromeliads and orchids, but I was really excited in finding a beautiful blue flowered irid, *Orthosanthus chimboracensis*, in flower in the mountains. The plant has the appearance of a *Sisyrinchium*, with the fan-like foliage of narrow grassy leaves. The showy sky blue *Aristea*-like flowers of this species are an asset to any garden. It has fibrous roots. The plant proved difficult to keep and none of my collection survived. A few more miles down the road, at a slightly lower altitude I found an amazing giant yellow-flowered *Sisyrinchium* with tuberous roots that proved to be the finest of all. The huge lemon yellow flowers were as

large as a half dollar and the large Iris-like plants produced stems several feet tall, making them a worthwhile addition to any garden. Growing with them was a bulbous irid of the tigridioid clan, but since they were not yet in flower I could not determine what they might be. Not wishing to pass up any good bets, I collected some of these as well.

Later that afternoon, as I neared the Oaxaca state line in a scenic mountain area that overlooks the Pacific ocean I stopped to recollect bulbs of *Eustylis purpurea,* another attractive tigridioid that grows from Costa Rica to Louisiana. This one has attractive violet purple flowers. Growing with it was a species of *Hypoxis* with long carrot-like tubers. The leaves of this *Hypoxis* were conspicuously plicate and it was very difficult to distinguish between *Hypoxis* and *Eustylis* without first digging them. Also growing in this general area was *Cipura paludosa,* another pretty white bulbous irid, with icy white flowers opening early in the morning. This *Cipura* species is another very widespread bulb that is apt to be encountered over very large areas on both coast lines of Mexico.

Arriving in Oaxaca City, we went to the market to get a crate for our kinkajou and then we picked him up. Chris was really tickled with the antics of our new passenger, but it quickly became evident that "Sam's" energy was overwhelming and it was necessary to keep him in his crate lest he cause us to have an accident. At any rate, Sam was a welcome relief to the boredom of so many miles of driving and we really did not mind his playful bites (and resulting teethmarks) too much. Sam loved fruit and feeding him was no problem since cafe owners were glad to give him a free handout just to watch him eat. Kinkajous are related to, and as amusing as, a raccoon, and they can be just as mischievous.

We did no more collecting until we reached the Oaxaca-Puebla state line, where to my knowledge grew several interesting bulbous plants, including an unusual *Sprekelia* species that I had first collected in 1962. This tiny little *Sprekelia* was the most unusual and most distinctive of any that I have seen, and the first time I saw it, I was sure that it must be a *Habranthus* and continued to regard it as such until it flowered and revealed its identity in the spring of 1964. The narrow silvery green foliage is deeply channeled and the 10″ scape has dainty little red flowers of a very spidery appearance with segs less than ½″ wide. I had thought that this country would be too dry to support Sprekelias, since it seemed better suited for cactus, such as the giant Tetetzo that grew here. We stopped to dig some bulbs of this little *Sprekelia,* when much to my surprise, I found a second *Sprekelia* species growing along with these dwarfs! This second *Sprekelia* was a larger, more conventional kind with long, bright green foliage and much larger bulbs. I looked, but could find no evidence of intermediate hybrids so I assumed that indeed we had two distinct species. We also found a small white *Anthericum* species with reflexed cyclamen-like white afternoon blooming flowers and dug a few of these for our collection.

Nearing Izucar de Matamoros, Puebla, I stopped at K 210, by a hillside to dig bulbs of *Zephyranthes nelsonii* at the same spot that I had first dug them in 1962. These grew on a rocky ledge above the highway along with both *Milla biflora* and the night blooming *Milla* species. *Hymenocallis glauca* is abundant in this area, and I had first collected them here in 1954. Under cultivation, *Z. nelsonii* has proved to be one of the prettiest species, as the flowers are well formed and blessed with an unusually sweet fragrance for a Zephyranthes. The flowers are usually white, but occasionally they may have a touch of pink, and the texture is remarkable in that there is an "icy" sparkle overlaying the segs. We did no more collecting until we reached Mexico City as I had pretty well checked over the country on three previous trips. We stopped at University City to collect a few more bulbs of the large white *Habranthus* species that grows so abundantly in volcanic soil in the lava beds surrounding the University. I first collected this species in 1957 and have since made other collections from time to time. The bulbs can get huge . . . as large as hybrid *Amaryllis*, and the robust glaucous foliage can be easily mistaken for that of a *Sprekelia*. There are both large and small flowered forms of this species growing in this area, but except for the size of the flowers they seem to be identical. Under cultivation they seem to be unpredictable, sometimes growing vigorously, and sometimes refusing to grow at all. One can never be sure how they will perform from one year to the next.

We drove right on through Mexico City and headed homeward. For the first time during our trip, Chris got sick. This came as no surprise to me, since nearly every traveler visiting Mexico for the first time is apt to get it. What surprised me is that it took him two weeks to finally acquire the "Curse of Montezuma". We had almost decided that he would not get it. I had long since developed an immunity after my first trip in 1953. I made but one more collection after that, in the state of Queretaro, to collect a few *Milla biflora*, a pink *Zephyranthes*, and some yellow Anthericums. Crossing the border was uneventful. There was the usual inspection and fumigation of our plants and the three hour trip home from Laredo. All in all it was a very successful trip, and there is always the possibility that perhaps a few plants may prove to be new to science and welcome additions to cultivation.

EDITOR'S MAIL BAG

The editor received a visit from Mr. and Mrs. W. W. Walton, 5318 Rivino Road, Riverside, Calif., on May 27, 1964.

Mr. W. Quinn Buck of the Los Angeles Arboretum, Arcadia, Calif., and Mr. Jack S. Romine, 6893 Charing Cross Road, Berkeley, Calif. 94705, visited with your editor. They were particularly interested in the tetraploid daylilies.

Dr. C. G. Rueppel, Casilla 370, Mendoza, Argentina, offers to exchange seeds of *Amaryllis*, and seeds of other unusual amaryllids, with members of the Society. Those interested should write directly to Dr. Rueppel.

The editor received a visit from Mrs. Frank McCown, Holtville, Calif., on Aug. 18, 1964. Mrs. McCown is interested in idids and amaryllids.

Mrs. M. S. Anthes, 123 Grandview St., Encinitas, Calif., who has imported some interesting new amaryllids, particularly from Argentina, visited the editor's garden on several occasions.

In August 1964, the editor enjoyed a visit from Mr. & Mrs. Clifford C. Smith, 5511 W. 116th St., Los Angeles, Calif. 90045, who brought a potted plant of *Zephyranthes grandiflora* Lindl., native to Mexico, (triploid sterile form) for identification. Mr. Smith had collected the original bulb in the wilderness area (Marble Mts.) of Northern California 12 years ago, but had not been able to have it identified. This plant had apparently been grown by some early settler in Northern California.

The members will be saddened to hear that Mr. C. Lloyd Burlingham, of Punta Gorda, Fla., a long standing member of the Society, died on Aug. 31, 1964, after a short illness.

Mr. & Mrs. E. R. Middelmann, of Honingklip Nurseries, "Barosma", Barmbeek Av., Newlands, Cape Town, South Africa, traveled in the United States from Nov. 1964 to Febr. 1965, showing their unusual and beautiful color slides which accompanied their lecture, "Proteas and Ericas, unusual flowering shrubs from the Cape of Good Hope."

Dr. Roujansky, Director, Etablissment Horticole, O. R. Du Grand-Tampon, B. P.: 31 Tampon, Isle de la Reunion, Ocean Indien, writes of his interest in *Amaryllis* and other amaryllids under date of November 1, 1964.

We have just learned (Nov. 16, 1964) that due to a heart attack, Mr. E. L. Brasol, and his family, have moved from their wonderful jungle farm into town. His many friends will be pleased to hear that he is now in good health. His address is: P. O. Box 1774, Daytona Beach, Fla. 32015.

The Ofuna Botanical Garden, No. 1018, Okamoto, Kamakura, Shi, Kanagawa-Ken, Japan, Dr. Motoo Shimizu, Director, has sent to the Editor pamphlets on the Garden, and the export of flowering plants from Kanagawa Prefecture. The plants listed do not include *Lycoris*, and these should be added. Hybrid *Amaryllis* are included.

Mr. C. W. Lander, 26 Cleveland Av., Milton Park, Salisbury, Rhodesia, writes under date of Nov. 11, 1964, that he is joining the ranks of *Amaryllis* breeders. We welcome him.

Mr. V. Roger Fesmire, 1170 South Xavier St., Denver, Colorado, the noted breeder of *Amaryllis*, visited with your Editor on December 7, 1964.

PLANT LIFE LIBRARY—continued from page 4.

THE PLANT KINGDOM, 2nd Edition, by H. C. Bold. Prentice-Hall, Englewood Cliffs, N. J. 1964. Pp. 118. Illus. Paper, $1.75; cloth, $3.95. Teachers and students will welcome this second edition of an outstanding text as part of a beginning course in biology. The subject matter is grouped under the headings—the unity and diversity of plants; the algae; bacteria; slime molds and fungi; mosses and liverworts; structure of vascular plants; seedless vascular plants—ferns; seed plants—gymnosperms, angiosperms; and summary. Highly recommended.

THIS VIEW OF LIFE—THE WORLD OF AN EVOLUTIONIST, by G. G. Simpson. Harcourt, Brace & World, Inc., 757 3rd Av., New York 17, N. Y. Pp. 308. $5.95. On the basis of a sound grounding in evolutionary biology, Professor Simpson has produced a brilliant exposition of his views on life. The subject is developed under the headings—approaches to evolution; evolution among the sciences; the problem of purpose; and evolution in the universe. This stimulating book is required reading for all biologists. Highly recommended.

WATER METABOLISM IN PLANTS, by Theodore Kozlowski. Harper & Row, 49 E. 33rd St., New York 16, N. Y. 1964. Pp. 227. Illus. $4.25. This stimulating new monograph on important aspects of water metabolism in plants at the cellular and whole-plant levels, by an outstanding authority, will be welcomed by teacher and student. The subject is developed under the headings—xerophytism and plant water balance; water relations of plant cells and tissues; absorption of water; water transport; loss of water; and effects of water deficits on plants. Highly recommended.

ERASMUS DARWIN—GRANDFATHER OF CHARLES DARWIN, by Desmond King-Hele. Chas. Scribner's Sons, 597 5th Av., New York 17, N. Y. 1963. Pp. 183. Illus. $3.95. This evaluation of the place of Erasmus Darwin (1731-1802) in literature and science is long overdue. Erasmus was among the most respected medical doctors of his time, a best-selling poet, and prolific inventor who also proposed scientific theories, including a theory of bioevolution. The author develops the evaluation under the headings 18th century medicine; life story; animal and vegetable; the theory of evolution; "The Botanic Garden"; "The Temple of Nature"; influence of the poems; inventions; and conclusions. Highly recommended.

GUIDE TO THE LITERATURE OF BOTANY, by B. D. Jackson. Facsimile of the 1881 Edition. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. Publ. 1964. Pp. 626. $12.50. This facsimile reprint of a standard botanical reference book includes nearly 6,000 titles not given in Pritzel's "Thesaurus" (2nd ed. 1872-7). Following the historical introduction, the literature of botany is classified under bibliography; history; biography; indexes; encyclopedias; keys to other books; nomenclators; systems; pre-Linnean botany; introductory works; physiological and morphological works; descriptive botany; paleobotany; economic botany; emblematic works; practical botany; local works; local floras; botanical gardens; and serial publications. This is an indispensable reference work for all interested in phytology.

HENDERSON'S—A DICTIONARY OF BIOLOGICAL TERMS, 8th Edition, by J. H. Kenneth. D. Van Nostrand Co., 120 Alexander St., Princeton, N. J. 1963. Pp. 640. $12.50. This 8th edition of a standard reference book will be welcomed by all biologists. The work has been extensively revised, and new material has been added, so that over 16,000 biological terms are included. The pronunciation, derivation and definitions of terms is indicated. An attempt has been made to include terms used in American texts. There is a table of equivalents—weights, measures, etc., a list of abbreviations used, and a list of sound-symbols used in pronunciation. There are apparently few omissions, such as the lack of cross references between "corona" and "paracrolla". This reference work is indispensable to all biologists and is highly recommended.

PLANT LIFE LIBRARY—continued on page 118.

1. REGIONAL ACTIVITY AND EXHIBITIONS

1964 AMARYLLIS SHOWS

The Official Amaryllis Shows for the year 1964 began on April 4—5, and ended on May 2—3.

The Men's Amaryllis Club of New Orleans Show was held April 4—5. This was followed by the Coastal Bend Amaryllis Society Show on April 11—12, the Garden Circles Amaryllis Club of New Orleans 15th Show on April 11—12; and the Greater Houston Amaryllis Club Show also on April 12. The Valdosta Amaryllis Show was held on April 18—19; the Houston Amaryllis Society Amaryllis Show was held on April 19; the 12th Greater Gulf Amaryllis Show of the Amaryllis Society of Mobile was staged on April 25—26, and The Hattiesburg (Miss.) Amaryllis Society Show on May 2—3.

OFFICIAL MEN'S AMARYLLIS CLUB OF NEW ORLEANS AMARYLLIS SHOW, 1964

WALTER R. LATAPIE, *Show Standards Chairman,*
3737 Elysian Fields Av., New Orleans, La. 70122

The Men's Amaryllis Club of New Orleans held their 7th Annual Show on April 4th and 5th, 1964. Continuing the tradition of their six previous shows, the Club again scored a huge success. Registered attendance exceeded 500.

Fig. 3. Trophy table Men's Amaryllis Club Show, New Orleans, 1964.

Again, a number of out of town visitors also enjoyed the exhibits. From the cities within Louisiana we had guests from Baton Rouge, Prairieville, Hansville, Luling, Thibodaux, Raceland, Belle Chase, Bastrop, Shreveport, Covington, Destrehan, and Port Sulphur. From out of the state, amaryllis enthusiasts came from Mobile, Ala., Lothan, Ala., Gautier, Miss., and Biloxi, Miss.

Awards in the horticulture section were received by: N. J. Clemcuts, tricolor winner in Dutch Hybrid class (Jessee Nursery award); Stephen P. Gaspereez, tricolor winner in American hybrid class (Newsham-Beenel award); Rodney F. Broussard, sweepstakes winner in Dutch hybrid class (Reuter Seed Co.); Rodney F. Broussard, president's trophy for most blue ribbons won by a member of the Men's Amaryllis Club (Men's Amaryllis Club award); Stephen P. Gaspereez, outstanding specimen of an American Seedling (Men's Amaryllis Club award); W. J. Perrin was silver cup award winner for runner-up for tricolor in Dutch hybrid class (Swetman challenge cup); Rodney F. Broussard, silver tray award winner for most blue ribbons in Dutch hybrid class (Swetman Amaryllis Garden trophy).

Awards of merit of the American Plant Life Society went to: E. M. Beckman, for Golden Triumphator; Mrs. A. J. Esteves, for Wyndham Hayward; W. J. Perrin, for Daintiness.

Preliminary Commendations were given to: E. F. Authement; Rodney F. Broussard; W. J. Perrin.

Mr. Frederic Schmitz, Assistant Professor of Horticulture, Plaquemines Parish Experimental Station, Diamond, La., (L.S.U. A and M College) again showed his colored slides and held discussions on *Amaryllis* during the afternoon of Sunday, April 5th.

James Mahan was Chairman of the Show, with Walter R. Latapie acting as Co-Chairman.

OFFICIAL COASTAL BEND AMARYLLIS SOCIETY AMARYLLIS SHOW, 1964

Mrs. Carl C. Henny, *Vice-President*
Corpus Christi, Texas

The Coastal Bend Amaryllis Society conducted its annual show in conjunction with the Lola Forrester Flower Show held in the Exposition Hall, April 11th and 12th, 1964.

Mr. Henry E. Lemoine received the Ludwig Challenge Trophy for winning the greatest number of blue and red ribbons in the registered pot grown Leopoldii and Reginae Type amaryllis.

Mr. Lemoine's Bouquet *Amaryllis* scored the highest in his collection. He also won a silver trophy for the highest scoring registered *Amaryllis*, potted plant, exhibited in the Amaryllis section of the show, scoring 97 points.

Mr. Harvey Vogt received a silver trophy for his entry, Maria Goretti, a Ludwig variety cut scape which scored highest in the registered Cut Scape section, scoring 97 points.

The highest Award of Merit for Bulbs and a blue ribbon for his entry of Ludwig's Apple Blossom cut scape were won by Mr. Richard A. Blucher, a non-member, scoring 98 points.

The Awards of Merit, issued by the American Plant Life Society, were awarded to Mr. R. A. Blucher, Mr. H. E. Lemoine, Mrs. William Lorenzen, Mrs. Cecil Redford, Mr. Harvey Vogt and Mrs. Charles E. Weeks, each scoring 96 points.

The Awards of Preliminary Commendation were issued to: Mrs. L. A. Buckner, Mr. Ted Herring, Mrs. C. E. Horton, Mrs. R. A. Hornberger, Mrs. W. S. Liles and Mr. Dennis Flinn, for outstanding entries within the Amaryllis Exhibit, all—95 points.

Members of the Coastal Bend Amaryllis Society received 22 Blue Ribbons, 15 Red Ribbons and 7 Gold Ribbons for their entries, making a total of 44 ribbons received.

Fig. 4. Coastal Bend Amaryllis Society Show, Corpus Christi, Tex., 1964. *Left,* Mr. H. E. Lemoine, winner Ludwig Trophy with 'Bouquet' (Lud.). *Right,* Mr. Harry Vogt, winner Silver Trophy, with 'Marie Goretti'; best cut scape in Show.

Among the Ludwig registered and names *Amaryllis* entered were 'Happy Memory', 'Masterpiece', 'Picotee', 'Square Dance', 'Beautiful Lady', 'Candy Cane', 'Streaking Stripes', 'Goliath', 'Ludwig's It', 'Cardinal', 'Rockett', 'Home Decorator', 'Dutch Belle', 'Champion's Reward', 'Bouquet' and 'Apple Blossom'.

A total of 96 entries were made in the show, with 90 awards being given. Accredited American Amaryllis Society Judges for the show were Mrs. Jesse Haver, Mrs. R. H. Schmuck and Mrs. R. L. Morgan, all from Houston, Texas.

Despite the lack of much needed rain and cold and cloudy weather this year, our society display was considered one of the most interesting in the flower show.

15th OFFICIAL AMARYLLIS SHOW, NEW ORLEANS, 1964

Mrs. John Klein, Jr., *Show Chairman,*
2504 Mistletoe St., New Orleans, La. 70118

The 15th Official Amaryllis Show in New Orleans, was sponsored by the Garden Circle Amaryllis Club. Affiliated with the American Amaryllis Society; The Federated Council of New Orleans Garden Clubs; Jefferson Council of Garden Clubs and the Louisiana State and National Federation of Garden Clubs, was held on Sat. April 11th and Sunday April 12th, 1964 at the Eleanor McMain Junior High School, 5712 So. Claiborne Avenue. 60 Garden Clubs participating in the Artistic Arrangements and Corsage Division.

Mrs. John Klein Jr. was Show Chairman; Vice Chairmen Mrs. A. R. Oddo and Mrs. A. J. Haydel.

The Horticulture exhibit was opened to the public. The Arrangements were judged by six accredited judges and the horticulture exhibit by nine Official Amaryllis Judges.

Award of Distinction and Silver Tray was given to Mrs. Oscar Paysee Jr. of the Pine Village Garden Club for her outstanding arrangement, titled Exotic. In the Corsage Division, Mrs. Robert Keller won the Blue Ribbon for her Formal Corsage for Odd and Fanciful, and Mrs. W. Prudhomme for the Informal Corsage "Precice an Trim".

The following awards were given: Mrs. W. J. Perrin won the Ludwig Challenge Cup for the best Ludwig Specimen 'Apple Blossom'. She also won the Reuter Seed Trophy, a beautiful Silver Tray for the outstanding Dutch Specimen in the Show 'Apple Blossom'. The Klein Award for the most Blue Ribbons in Dutch Horticulture was given to Mr. Milo C. Virgin. Sweepstake Ribbons for the most Blue Ribbons in American Horticulture to Mrs. Frank Ramos and Mrs. Harry St. John who tied.

Best Two Floret to Mrs. A. J. Haydel was a Silver Tray.

Best Three Floret to Mr. Rodney Broussard a Silver Tray. The New Orleans Public School Award to McDonogh No. 7 School for the Third Consecutive Year. Mrs. J. C. Zwicke Award of Merit Ribbon for the best Cut American Specimen. Award for the best single floret for Garden Circle Amaryllis Club Member only was given to Mrs. M. G. Authement.

The awards of merit from the American Amaryllis Society went to Mrs. A. J. Haydel, Mrs. W. J. Perrin, Mrs. M. G. Authement, Mr. Milo C. Virgin, and Mrs. John Klein Jr.

P. C. Awards were given to Mrs. John Klein Jr., Best Seedling (Dutch); Mr. Milo C. Virgin, American Seedling; Mrs. F. L. Ramos, American; Mrs. J. C. Zwiche, American; Mrs. A. Guizirix, American; Mrs. A. Autry, American.

Blue Ribbon winners in Horticulture were Mrs. A. J. Haydel, Mrs. John Klein Jr., Mrs. W. J. Perrin, Mrs. M. G. Authement, Mrs. William Morgan, Mr. Milo C. Virgin, Mr. Rodney Broussard, Mrs. J. C. Zwiche,

Mrs. A. P. Guizerix, Mrs. F. L. Ramos, Mrs. Ed. Landry, Mrs. A. Autry and Mrs. Harry St. John.

There were Six Invitational Arrangements Displayed on Pedestals by non-competitive Guest Artist.

There were 196 entries in Horticulture and over 500 people attended the Show including a number of visitors from out of State such as Alabama, Mississippi and Texas.

The 15th Official Amaryllis Show was displayed by division 1 to 9 as per Revised Show Schedule for Official Amaryllis Show in 1961 Amaryllis Year Book.

OFFICIAL GREATER HOUSTON AMARYLLIS CLUB SHOW, 1964

Mrs. Sally Fox

Breathtaking, beautifully colored amaryllis blossoms greeted an overflow crowd Sunday, April 12, 1964, at the Garden Center when the Greater Houston Amaryllis Club proudly presented their annual flower show with the theme "Amaryllis Around The World". Mrs. Walter D. Wells, Sr. was general chairman, capably assisted by all members to stage an outstanding show.

Arrangements to represent many countries where amaryllis are native were shown by the members. The staging committee carried out the theme of the show with a mammoth ten foot "world", which drew favorable attention.

Competition was keen for the beautiful trophies. The highest award, along with an official merit of award from the American Amaryllis Society, was won by Mrs. Walter D. Wells, Sr. for Little Diamond, a blend of pink and white. This well-known grower also was awarded the Ludwig Challenge Cup for a miniature type Firefly, as well as a trophy for the best Dutch collection. Other winners were: For second high in named and registered Dutch specimen, and an official award of merit from the American Amaryllis Society, Mrs. W. S. Wheeler. For best named and registered Dutch cut specimen, Mrs. R. A. Fawcett. For best American Hybrid specimen, Mrs. R. A. Fawcett. For highest commended Dutch seedling, Mrs. C. R. Frampton. For best new introduction of Dutch Hybrids, Mrs. Charles H. Pease. Mr. W. S. Wheeler was awarded a silver tray for the best blossom in the invitional class.

A highlight of the show was the educational booth which was most unusual and truly educational since it showed the various stages of breeding a native (or wild) *Amaryllis* grown in its original natural state in the foreign countries with various pollen parents to develop the good growing habits in both, thereby producing a variety that would be appealing.

Guests were asked to vote for their favorite blossom in the show and a dark red blossom "Queen Superiora", was the selection by a

Fig. 5. Greater Houston Amaryllis Club Show, 1964. Part of the exhibits.

great margin. Next was "Floriade", a blend of pink and white and "Golden Triumphator", a salmon blend, third.

A refreshment table where the visitors could enjoy a cup of punch and cookies was added to the 1964 Show. This brought a lot of favorable comment.

OFFICIAL VALDOSTA AMARYLLIS SHOW, 1964

GUY RICE

The Official Valdosta Amaryllis Show was held April 18—19, 1964, at the Garden Center Auditorium. It was sponsored by the Valdosta Men's Garden Club and the American Amaryllis Society.

Mrs. Hyta Mederer was sweepstakes winner; and Mrs. C. H. Mock had the most outstanding entry in Horticulture with 'Floriade'. Top honors were awarded to Mr. Hulyn Smith for a potted plant of 'Rembrandt'; to Mr. James Wheeler, for a cut scape of 'Apple Blossom'; to Mr. Guy Rice for seedlings in hybridizers class.

OFFICIAL HOUSTON AMARYLLIS SOCIETY SHOW, 1964

MRS. A. C. PICKARD, *Official Show Standards Chairman,*
MRS. JOE E. CRAFT, *Flower Show Chairman*

"Amaryllis, our promise of Spring" was the theme of the Houston Amaryllis Society's Official Show, held in the Houston Garden Center, April 19, 1964.

To a flower lover, gardener and flower arranger the Society's show has grown to be the most popular event of the Spring season.

The classification of entries included the named and unnamed species from Division 1 through Division 8 with exception of Division 2, long trumpet. Unclassified (non registered) were grouped by countries of origin.

Exhibits in possession less than one year were classified in a separate section from exhibits grown more than one year. However, the two separate sections were competitive, as it requires less effort to bring into bloom the newly purchased bulb.

Potted plants were placed in classes by number of scapes per plant. Collections, minimum 5 specimens, named and registered Dutch (all one color), Dutch named and registered, all different, all garden grown added another point of interest.

Under the Amaryllid section the Clivias were proudly displayed with their lovely umbels of salmon flowers with yellow throats.

The educational section showing methods of vegetative and asexual propagation always seems to appeal to the public.

Most interesting additions to the show were the two six foot tables of Dutch A. seedlings from the Pickard's Amaryllis Gardens, hybridized by Mrs. A. C. Pickard. All were Leopoldii type in colors from dark red through all shades of pink. Another six foot table held many

Fig. 6. Houston Amaryllis Society Show, 1964. Part of the exhibits.

outstanding seedlings grown by other members of the H.A.S. It was difficult to select favorites from so many new arrivals.

The horticulture section would not be complete without mention of high praise for the "Junior Amaryllis Society" exhibits of cut and potted Dutch specimens, including their educational table demonstration of seed planting to seedling, and named clone.

Invitational classes in horticulture and artistic sections displayed the growing interest in the Amaryllis world.

The Artistic section was executed with perfection, featuring Amaryllis in various arrangements.

A sponsored art exhibit by one of Houston's most popular masters of art was acclaimed for its outstanding beauty.

The H.A.S. show was a standard competitive official show. Horticulture was judged by official Amaryllis judges. There were 7 classes in artistic arrangements including the invitational class for Jr. judges and a class for national flower show judges. Mrs. W. L. Offenbacher won the tri-color in the Artistic section.

In the Horticulture section the following received the highest A.M. and H.A.S. Trophies; 'Boquet' (Lud.) A.M. & H.A.S. Trophy—Mrs. Carey Z. Brown; 'Golden Triumphator' (Warm.) A.M. & H.A.S. Trophy—Mrs. Joe E. Craft; 'Home Decorator' (Lud.) A.M. & Ludwig Cup—Mrs. M. E. Shelton; 'Pamela' (Lud.) A.M. & H.A.S. Trophy—Mrs. E. O. Griener; Breeders class: 'Dutch Seedling' P.C. & H.A.S. Trophy—Mrs. A. C. Pickard; 'Dutch Collection' H.A.S. Trophy—Mrs. A. C. Pickard; 'Apple Blossom' (Lud.) Houston Junior A.S. Founders Trophy—Robert Guenther.

The Houston Amaryllis Society is a working group and we renew our acquaintance each Spring with old favorites with the same joyous expectations that we greet the new arrivals.

12th OFFICIAL GREATER GULF AMARYLLIS SHOW, 1964

Miss Mildred Laughlin, *Secretary*
701 Dauphin Isle Parkway, Mobile, Alabama

The Amaryllis Society of Mobile staged its 12th Annual Greater Gulf Amaryllis Show, April 25 and 26, 1964, in Mobile, Alabama at the Murphy High School Cafeteria. Colonel Robert Pollack was Show Chairman and W. A. McCollum, Russell Ludlow and J. C. McRae acted as his Co-Chairmen.

Theme of the Show was AMARYLLIS UNDER FIVE FLAGS, with the theme being developed in the General Show decorations and the Artistic Arrangements.

The focal point of interest upon entering the Show was a large flagstaff containing the five flags side by side. Centered and in front of the flags was a small cannon. The display being enclosed with a small white picket fence which was flanked by *Amaryllis*.

Eighteen accredited judges from Hattiesburg, Mississippi, Pensacola, Florida and Biloxi, Mississippi judged the show. Award winners were:

Col. Robert Pollock, Sterling Silver Paul Revere Bowl for winning the most blue ribbons in show, including Horticultural and Artistic Arrangement Division; Silver Chased Tray with handles as winner of the most blue ribbons in horticultural division; Large Silver Tray with handles awarded for winner of the most blue ribbons in the combined Dutch Hybrid Potted and Cut Amaryllis Divisions; Silver Tray with handles as winner of the Most Blue Ribbons in the Dutch Hybrid Potted Amaryllis Division; Sterling Silver Cup for the Most Blue Ribbons in Dutch Named Varieties; Silver Cup for the Most Outstanding Hobby Collection of Amaryllis; Silver Bowl for the Most Blue Ribbons in unnamed Potted Seedlings; and Silver Bowl for the Most Blue Ribbons in the Single Bloom Named Division.

Mrs. J. C. McRae, Sterling Silver Vase for the Most Blue Ribbons in Artistic Arrangement Division; and The Inez Scheurmann Invitation Trophy with the entry for the Rose Club in the Invitational Class for Garden Clubs.

Miss Darby Hickson, Silver Trophy for Best Painting of Amaryllis (in Junior Division), and Silver Trophy for the Junior with the most blue ribbons.

C. E. Tagert, Sr., Silver trophy for Most Outstanding Horticultural Cut Specimen of Dutch Amaryllis in Show; Silver tray with handles for the Most Blue Ribbons in Dutch Hybrid Cut Amaryllis.

Wilmer Smith, Silver Bowl for the Most Blue Ribbons in the unnamed Cut Seedlings; Silver Bowl for the Most Blue Ribbons in the Single Bloom unnamed Division.

Mrs. Robert Waterhouse, Sterling Silver Sandwich Tray awarded for the Most Outstanding Horticultural Potted Bulb Specimen of Dutch Amaryllis in Show.

Mrs. R. E. Chason, Silver Trophy for the Most Outstanding Horticultural Potted Bulb Specimen of Amarycan Hybrid Amaryllis in Show.

Mrs. T. W. Antoine, Silver Trophy for the Most Outstanding Artistic Arrangement of Amaryllis in Show.

Miss Virginia Sherwood, Silver Trophy for the Best Painting of Amaryllis.

Mr. Jeff Brown, Silver Trophy for the Most Outstanding Horticultural Cut Specimen of American Hybrid Amaryllis in Show.

Mr. W. A. McCollum was given a Special Award Ribbon on his Hobby Display.

Col. Robert Pollack acted as Master of Ceremonies for the occasion. The Awards and Trophies were given by Mrs. A. B. Palmer, Chairman of that Committee, with the assistance of the President, Mr. Wilmer R. Smith.

4th OFFICIAL HATTIESBURG AMARYLLIS SOCIETY SHOW, 1964

Mrs. Sam Forbert, *1910 Evergreen Lane, Hattiesburg, Miss.*

The 4th Official Hattiesburg Amaryllis Society Show was held May 2—3, 1964 at the Garden Center. Several hundred enthusiastic Amaryllis fanciers came to view the outstanding array of blooms. The Show theme "Creating Beauty" was inspirational and tended to guide creative minds and hands in action. Friendly rivalry existed among members in both Horticulture and Artistic Design divisions of the Show. This resulted in the best Show up to the present.

This is to be expected because for the past seven years members have been growing Amaryllis from seeds, and these crosses of Dutch and American clones, are now coming to maturity and the flowers are coming into the Show. Wonderful new colors and forms are being produced and in due time when proved meritorious, will be registered and named. Hundreds of named clones are being planted each year, both in pots and outdoors.

Mrs. Charlie Bell's 'Heaven Sent' (Ludwig) was voted the most beautiful clone in the Show by an overwhelming majority vote of the visitors to the Show. 'Cardinal', 'Beautiful Lady', 'Streaking Stripes' and 'Happy Memory' each received a large vote also.

The Official Amaryllis Judges for the Horticultural Division were: Mr. and Mrs. J. A. Brown, Mr. W. C. Strain, Mr. W. R. Smith, Mr. W. A. McCollum and Mrs. A. B. Palmer, all of Mobile, Ala. The Artistic Design Judges were: Mrs. R. E. Goodwin, Mrs. S. D. Case, and Mrs. John B. Guenther, nationally accredited Flower Show Judges of Jackson, Miss. They judged thirty designs in six classes including both Free-Form-Interpretive and Geometric. There are fifteen nationally accredited Flower Show Judges in our Society which perhaps accounts for the expert workmanship in the designs displayed.

Winners of the Silver Awards were Mrs. Charlie Bell, Sweepstakes, with sixteen blue ribbons, captured the Swetman Traveling Trophy (Swetman Amaryllis Nursery, Gautier, Miss.).

Mrs. Charlie Bell, Best unnamed seedling, an outstanding red from Ludwig. Mrs. O. F. Coursey, Award of Merit for 'Zenith'. Mrs. John D. Askew, for a cut scape of 'Apple Blossom'. Mrs. Sam Forbert won in both cut scape and potted American hybrids. Miss Lucile Parker, exhibited the best painting of an Amaryllis in the Show.

Mrs. Paul Bailey received the tri-color award for a crescent design. Mrs. B. M. Lewis, received an Award of Distinction for a Free-Form Interpretive design. Mr. Robert D. Goedert, Amaryllis Bulb Dealer, of Jacksonville, Florida, donated the bulbs for the prizes.

Official American Amaryllis Society Awards of Merit were given to: Mrs. Charlie Bell, for 'Invincible', 'Cardinal', 'Streaking Stripes' and a Ludwig seedling; Mrs. O. F. Conway, for 'Zenith'; and Mrs. J. W. Snowden for 'Beautiful Lady'.

Preliminary Commendations from the American Amaryllis Society were awarded to Mrs. Sam Forbert for a cut scape of a seedling (Dutch-American cross), cut specimen (American seedling), a potted American seedling; Mrs. Charlie Bell, for a seedling raised from 'Apple Blossom'; Mrs. Jhnonie Jackson, for an American seedling; and Mrs. Charlie Bell, for a seedling grown from Ludwig stock.

GREATER HOUSTON AMARYLLIS JUDGES COUNCIL

The fast growing Gulf Coast area, where plant life enjoys abundant growth and where weather conditions are favorable for growing amaryllids, which have become more and more popular, has been lagging in sufficient accredited amaryllis judges to assist at the many shows each Spring. Realizing this, two well known Houston growers, who are accredited judges, conducted classes for members of The Greater Houston Amaryllis Club: Mrs. Walter D. Wells, Sr. in Horticulture and Mrs. W. S. Wheeler in flower arranging. The classes and examination were held in the home of Mrs. Wells at no cost to the members. As a result the area now has six additional accredited amaryllis judges, all members of The Greater Houston Amaryllis Judges Council, which was organized in January, 1964.

The Greater Houston Amaryllis Judges Council held monthly meetings during the blossoming period of the amaryllids, which will be their future policy. This Council has limited its membership to authorized amaryllis judges who must be active growers of varied types of amaryllids, with emphasis on each member growing some species.

The purpose of the Council is primarily to keep up with new rules on judging, as well as new trends in amaryllis and results of experiments of the various hybridizers.

The present officers are: Mrs. W. S. Wheeler, President, Mrs. Walter D. Wells, Sr., Vice President, and Mrs. Sally Fox, Secretary-Treasurer.

THE SOUTHERN CALIFORNIA HEMEROCALLIS AND AMARYLLIS SOCIETY FOUNDED

This Society was founded in 1964 and will hold its first Amaryllis Show on April 24—25, 1965. Those interested in joining and or exhibiting at the show should write to Mrs. Dorothy Rose, Secretary, 10300 Rosewood Av., South Gate, Calif.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1964 Amaryllis Year Book (page 31), the following named Amaryllis Judges Certificates have been issued by the American Amaryllis Society:

134. Mrs. Earle W. Purser, 1523 Milford, Houston, Tex. 77006 (Horticulture only).
135. Mrs. K. C. Poulsen, P. O. Box 337, Lake Jackson, Tex. 77566 (Horticulture only).
136. Mrs. Esther Cash, 1101 E. Cedar, Angleton, Tex. (Horticulture only).
137. Mrs. L. E. Morgan, 1220 Chevy Chase Drive, Angleton, Tex. (Horticulture only).
138. Mrs. Thomas S. Behr, 5345 Windswept Lane, Houston, Tex. 77027 (Horticulture only).
139. Mrs. E. E. Koon, 1147 Panama, Houston, Tex. (Horticulture only).
140. Mrs. George Harris, 316 E. Bernard St., Clute, Tex. (Horticulture only).
141. Mr. Carey F. Brown, 9328 Leto Road, Houston 55, Tex. (Horticulture only).
142. Mrs. Lucy D. Wilkinson, 1008 Morningside Dr., Angleton, Tex. (Horticulture only).
143. Mr. Santo N. Cuchinotto, 2338 Independence St., New Orleans, La. 70117 (Horticulture only).
144. Mr. Barry W. Clark, 2735 Lavender St., New Orleans, La. (Horticulture only).
145. Mr. James E. Mahan, 3028 Palmyra St., New Orleans, La. (Horticulture only).
146. Mrs. Tracy T. Word, 3219 Fairhope St., Houston, Tex. 77025 (Horticulture only).
147. Mrs. A. F. Segatske, 2611 Oaks Drive, Pasadena, Tex. 77502 (Horticulture only).
148. Mrs. V. V. Hubby, 716 Heron Lane, Pasadena, Tex. 77502 (Horticulture only).
149. Mr. Tracy T. Word, 3219 Fairhope St., Houston, Tex. 77025 (Horticulture only).

AMARYLLIS REGISTRATION—continued from page 100

Registered by G. C. Van Waveren & Sons, Heemstede, Holland:

Reg. No. A-827, 'Berenice', very dark velvet red.
Reg. No. A-828, 'Daphne', brick red.
Reg. No. A-829, 'Durango', clear orange.
Reg. No. A-830, 'Fortuna', salmon with dark throat.
Reg. No. A-831, 'Hecuba', orange.
Reg. No. A-832, 'Odin', salmon pink.
Reg. No. A-833, 'Orion,' rose with white.

CONTROLLING MEALYBUGS—continued from page 152.

and meanwhile, the mealybugs are gone. It is my understanding that this material has both a systemic and contact effect in controlling insects.

The folder accompanying my bottle of Cygon 2E did not list any amaryllids at all, but for "Poinsettias and Outdoor Plants" it recommended a spray of 2 teaspoonfuls of Cygon 2E to the gallon of water, for control of mealybugs, Mites, white flies and aphids. I have simply used that strength, both as a spray and for immersing entire pots of growing bulbs. If there is any damage to the plants, I haven't noticed it.

This sounds like a patent medicine commercial or testimonial. I have no interest whatever in the manufacture or sale of this material, but am so grateful for it's killing the mealybugs on my plants that I'm glad to spread the news.

CONTROL OF AMARYLLIS LEAF TROUBLE IN AUSTRALIA

C. A. Campbell, *New South Wales*

In the past I have had trouble with black and reddish-brown spots on *Amaryllis* leaves. [This is apparently the red leaf spot of *Amaryllis*. —Editor] I tried many kinds of sprays for fungi and insects obtainable on the market over the years, but without success. Recently I tried the commercial product, "Phenyle" on the plants with the spotting, using it at the rate of 2½ tablespoons of the product to one gallon of water. Before application, I cut away all of the affected leaves; "Phenyle" was sprayed on the plants two times a week. At the end of two weeks, the young leaves appeared normal without any spotting. On the basis of this experience, I spray all of my *Amaryllis* once each week with "Phenyle", and the leaves are now a beautiful green color. It may be that others having similar trouble would like to try this method of control for spotting of *Amaryllis* leaves.

59 Gannons Road,
Caringbah, New South Wales.

(Editorial note: It is hoped that Mr. Campbell will publish a note about the composition of "Phenyle" so that we may obtain an idea of what the active substance is which is effective in controlling red leaf spot in *Amaryllis*.)

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

FOUR NEW BOLIVIAN **AMARYLLIS** SPECIES

MARTIN CARDENAS

Amaryllis umabisana Cardenas, **sp. nov.**

(Macropodastrum) Bulbus ovoideus, tegumentum nigriscentibus obtectus, 6-7 cm long. 6 cm crassus. Foliis erectis, 30-35 cm long., 1.5-2 cm latis glaucus. Scapo plusminusve 30 cm long., 1 cm crasso, parce compplanato, herba viridis. Umbella 2-3 flora. Bracteis spathaceis 7 cm long, albidis apice bruneis. Pedicellis 2-3 cm long., 5 mm crassis. Floribus 17 cm long, niveo albis, fragrantibus. Ovario diluto viride, 12 mm long, 5 mm crasso. Tubo 3.5 cm long, 5 mm crasso. Setepalsegmentis 10 cm long, 3 cm latis, lanceolatis, mucronatis, albis a basim viridiscentibus. Petepalsegmentis lanceolatis 10 cm long., 2.5 cm latis, margo undulatis, niveo albis, a basim viridibus. Staminibus 5-6 cm long. Filamentibus albis a basim viridibus. Antheris 6 mm long, flavis. Stylo 6 cm long, albo a basim viridis. Stigma trifida alba. Lobis stigmaticis 5 mm long. Paraperigonium diluto viridis.

Patria: Bolivia. Provincia Bilbao. Departamento Potosi, prope Umabisa 2,600 m.

Fig. 7 *Amaryllis umabisana* Cardenas, *sp. nov.*

Bulb ovoid covered by almost black skin, 6-7 cm long, 6 cm thick. Leaves erect 30-35 cm long, 1.5-2 cm wide, gray green. Scape about 30 cm long 1 cm thick, fresh green somewhat flattened. Spathe valves 7 cm long whitish, brown tipped. Umbel 2-3 flowered. Pedicels 2-3 cm long, 5 mm thick. Flowers 17 cm long. 8 cm limb scented. Ovary 12 mm long, 5 mm thick light green. Tube 3.5 cm long, 5 mm thick above ovary, greenish white. Setepalsegs lanceolate 10 cm long 3 cm wide pure white, mucronate, greenish at the base. Petepalsegs lanceolate 10 cm long, 2.5

cm wide, curled at edges, snow white, deflexed, greenish at base. Stamens 5-6 cm long; filaments white, greenish at base; anthers 6 mm long, yellow. Style 6 cm long surpassing stamens, white, greenish at base. Stigma trifid with 5 mm long lobes. Paraperigone light green bearing few hairs.

Fig. 8. *Amaryllis incachacana* Cardenas, *sp. nov.* (upper) flowering scape, and capsules; (lower) ovary, tepaltube, and tepalseg; also stamens and pistil (natural size).

Bolivia. Province Bilboa. Department of Cochabamba, near Umabisa, 2,000 m. On rocky cliffs among xerophytic bushes, November 1960, M. Cárdenas No. 6,100 (Holotype) in Herbarium Cardenasianum.

Obs.—This species recalls *A. chionedyantha* Cárd. by its long tube, and fragrant pure white flowers. Differs however by its very erect habit, its shorter flower parts and its xerophytic habitat which is unusual for *Amaryllis*. Another physiological character of this rare *Amaryllis* is that it does not flower even in Cochabamba at an elevation of only 2,500 m. and with similar dry air conditions.

Amaryllis incachacana Cardenas, **sp. nov.**

Bulbo globoso 7 cm long. Foliis loratis 40 cm long. 3 cm latis herba viridis a basim purpureis. Scapo 50 cm long. cylindrico. parce compplanato superne glauco. inferne purpureo 2.5 cm a basim crasso. Umbella 7-8 flora. Bracteis spathaceis 5-6 cm long lanceolatis bruneis. Pedicellis 3.5-5 cm long 3 mm crassis atro viridis. Floribus 7-8 cm long roseo lilacinus. Ovario 8-12 mm long. 6 mm crasso, trigono, atro viridis. Tubo 7 mm long. atro viridis. Setepalsegmentis lanceolato spathulatis 6-7 cm long. 2-2.5 cm latis, diluto roseis, linea media alba 3 mm lata instructis. Petepalsegmentis lanceolatis roseo lilacinis, linea media alba ostentis. Staminibus 4-5 cm long. Filamentibus albidis. Antheris 3 mm long. flavis. Stylo 6-7 cm long. Stigma trifida atro purpurea. Capsula triloculata 1-1.5 cm alta, 2.5-3 lata, atro-viridis.

Patria: Bolivia. Provincia Chapare. Departamento Cochabamba, prope Incachaca, 2,000 m.

Bulb globose about 7 cm in diameter covered by several brown tunic sheets. Leaves lorate 40 cm long, 3 cm wide, fresh green, purple at the base and unusually thick. Scape 50 cm long cylindric to slightly flattened at the base, glaucous above purplish below. Umbel 7-8 flowered. Spathe valves 5-6 cm long lanceolate, brownish. Pedicels 3.5-5 cm long at anthesis, dark green. Flowers 7-8 cm long, light purple to pink lilac. Ovary 8-12 mm long, trigone, 6 mm thick dark green. Tube 7 mm long dark green. Setepalsegments lanceolate to spathulate 7 cm long, 2.5 cm wide, light pink with a central white 3 mm wide line outside and red streaks inside. Petepalsegments lanceolate of same size and colour as setepalsegments. Stamens 4-5 cm long; filaments whitish; anthers only 3 mm long, yellow. Style 6-7 cm long. A very conspicous nectar cavity at the bottom of tube. Stigma trifid dark purple. Capsules similar to those of *A. belladonna*, L. 1-1.5 cm high, 2.5-3 cm broad, dark green with darker colour at the septal lines.

Bolivia. Province of Chapare. Department of Cochamba, near Incahaca, 2,000 m. No. 6102 (Holotype) in Herbarium Cardenasianum.

Obs.—This rare species of *Amaryllis* was obtained for study from a lady living at Cochabamba who said she obtained it from Incachaca. We have not collected it although we have visited Incachaca several times. It is like *A. mollevillquensis* Cárd. in the size and number of flowers. It is characterized by its thick leaves and the white middle line on the tepalsegs.

Amaryllis Pseudopardina Cardenas, **sp. nov.**

Bulbus globosus 5-6 cm long. Foliis loratis 30-35 cm long., 2.5 cm latis, herba viridis. Scapo 10-16 cm long. parce compplanato, viridis. Umbella 2 flora. Braceteis spathaceis lanceolatis 7 cm long. flavidulis vel purpureis. Pedicellis 2-3 cm long., 3 mm crassis, viridis. Floribus actinomorphis, 11 cm long. Ovario trigono, 1 cm long. 5 mm crasso atro viride. Tubo brevis, 4 mm long. extus atro viridis. Setepalsegmentis 10 cm long. 2.5 cm latis, lanceolatis, mucronatis, exteriora cremea viridis, interiora alba viridiscente a marginem, sanguinea rubra a zonam media. Petepalsegmentis lanceolatis, 9.5 cm long., 3 cm latis, exteriora cremea viridis, interiora sanguinea rubra, cremea marginata. Paraperigonium viridiscentibus. Staminibus 7-9 cm long. inferne diluto viridibus, superne albis. Antheris 3-5 mm long. flavis. Stylo stamina superans 9-10.5 cm long. inferne temperato viridis, superne atro-purpureo. Stigma parva trilobata, purpurea lila marginata. Capsula trilocularis, 3 cm. long., 3 cm. crassa atro viridis. Semina membranacei alata atro brunea 18 mm. long.

Patria: Bolivia. Provincia Chapare. Departamento Cochabamba. Yungas de Corani. 1,500 m.

Fig. 9. *Amaryllis pseudopardina* Cardenas, *sp. nov.*; flower scape.

Bulb globose 5-6 cm long. Leaves lorate 30-35 cm long, 2.5 cm wide, fresh green. Scape 10-16 cm long slightly flattened, 8-11 mm thick, dark green, purple flushed. Umbel quite always 2 flowered. Spathe bracts lanceolate 7 cm long, yellowish purple. Pedicels 2-3 cm long, 3 mm thick, fresh green. Flowers regularly actinomorphic., 11 cm long, 10 cm across limb, not completely opened. Ovary 3 ribbed, 1 cm long 5-6 mm thick, dark green. Tube very short, 3-4 mm long, dark green. Setepalsegments lanceolate acute to mucronate 10 cm long, 2.5 to 3 cm wide, cream greenish outside, white greenish with a solid blood red central band inside. Petepalsegments lanceolate, mucronate, 9.5 cm long, 3 cm wide of the same colour as are the setepalsegments. The lower petepalsegments narrower, only 2.5 wide. Paraperigone light green with 5 mm long hairs closing entirely the tubular throat. Stamens 7-9 cm long light green below, whitish above; anthers 3-5 mm long, yellow. Style longer than the stamens 9-10.5 cm long, light green below, dark purple above and again white greenish at the very base of stigma. Stigma slightly trilobate, purple bearing a lilac bordering line around the lobes.

Capsule triocular, 3 cm. long, 3 cm. in diam., dark green with darker or blackish borders. Seeds flat, D-shaped, membranaceus, dark brown 18 mm. long.

Bolivia. Province of Chapare. Department of Cochabamba. Yungas of Corani, 1,500 m. February 1959. M. Cárdenas, No. 6,094 (Holotype) in Herbarium Cardenasianum.

Obs.—This handsome species is reminescent of *A. pardina* Hook f. in the color of the tepalsegs but differs by its not deflexed flower segments and the wide rare solid blood red band at the middle of tepalsegs which is continued by red streaks towards its borders. The short scape is always 2-flowered.

Fig. 10. *Amaryllis pseudopardina* Cardenas, *sp. nov.;* 1. capsule and 2. seeds (natural size).

Amaryllis yungacensis Cardenas et Nelson, **sp. nov.**

Bulbus globosus 5—7 cm. long. Foliis loratis 30—50 cm. long. 2—3.5 cm latis a basim angustatis, viride glaucescentis. Scapo 25—35 cm long. 12 mm a basim crasso, viridis. Umbella 2 flora. Bracteis spathaceis atro purpureis 5—6 cm long. Pedicellis 2—3 cm long. 5 mm crassis, dilute viridis. Floribus fere actinomorphis, 11 cm long. Ovario 1 cm long, 8 mm crasso atro viridis. Tubus brevis 4 mm long. atro viridibus. Setepalsegmentis late lanceolatis 10 cm long. 3—4 cm latis, mucronatis, inferne diluto viridis, superne atro vinoso rubis. Petepalsegmentis lanceolatis 9.5 cm long. 2.5—3 cm latis, inferne viridibus, superne atro vinoso vel lilacino rubis. Paraperigonium temperato viridis 2 mm altis, pectinatis. Staminibus 8—9 cm long. sursum curvatis; filamentis diluto viridis; antheris 7 mm long. flavis. Stylo stamina superans 11.5 cm long. inferne diluto viridis, superne albis. Stigma 2 mm crasso, trilobata, magenta.

Patria: Bolivia. Provincia Sud Yungas. Departamento La Paz, prope Rio Solacama, 1,800 m.

Fig. 11. *Amaryllis yungacensis* Cardenas & Nelson, *sp. nov.* (left), flowering scape and leaves; (right) 1. setepalseg, 2. petepalseg, and 3. stigma (natural size).

Bulb globose 5-7 cm long. Neck of bulb 3.5 cm long. Leaves lorate, 30-35 cm long, 2-3.5 cm wide, narrow at base, grayish green (moderate yellow green—Nickerson Color Fan 5GY 5/6). Scape 25-55 cm long, 12 mm thick at base, green with a purple flush at the base. Umbel 2-flowered. Spathe valves purplish red and remain fresh for 2 to 3 days after anthesis, 5-8 cm long, 1.5 cm wide. Pedicels 2-5.9 cm long, light green, 5 mm thick. Open flowers quite regularly actinomorphic about 11 cm long and 13 cm wide. Ovary 1.5 cm above, 8 mm below, 7-8 mm thick, olive green tinged with red. Tepaltube short 4 mm (1.7 above, 1.3 below) same color as ovary. Top setepal broadly lanceolate 10-12 cm long, 3-4.4 wide mucronate. Lower sepals 10-11.9 cm long, 3.9-4.-1 wide mucronate. Setepalsegs with basic ground color of yellow green (brilliant yellow green—Nickerson Color Fan 2.5GY 8/9) fading to almost white on segment margins. Upper 1/3 of segments dark red (moderate red—Nickerson Color Fan 2.5R 4/10) with deeper red venation (dark red—Nickerson Color Fan 2.5R 3/7). Wide yellow green keel extends from base to tip of segments on inner surface only. Bottom petepalseg 9.5-11.2 cm long, 2-2.75 cm wide, lanceolate, colored same as setepalsegs. Keel on inner surface does not extend to tip of segment. Upper petepalsegs 9.5-11.7 cm long, 2.5-3.5 cm wide lanceolate. Colored same as bottom petepalseg. The two upper petepalsegs are more reflexed. The lower petepalseg is slightly plicate near the base to support the androecium. Paraperigone light green callus 2 mm thick with incurved white hair-like appendages. Filaments of 2 length groups 8.0-10.3 cm long, ascending, yellow green below fading to white above. Anthers 1.25 cm long before dehiscence, 7 mm long after dehiscence, yellow. Style longer than stamens, 11.5-13.7 cm, yellow green at base fading to white above. Stigma 2 mm thick, strongly trilobed, magenta. Fruit, 3-celled, many seeded, dehiscent capsule about 3.5 cm in diameter. Seed, flattened, D-shaped, very thin and paper like, turning black at maturity, to 1.8 cm long, 1.0 cm wide.

Bolivia, Province of Sud Yungas. Department of La Paz. Banks of River Solacama, Nov. 7, 1958, M. Cardenas and I. S. Nelson, No. 6093 (Holotype) in Herbarium Cardenasianum, No. U.S.L. 1786, Ornamental Horticulture Herbarium, University of Southwestern Louisiana.

Obs. Bulbs of this species were introduced into the United States by both collectors since 1958. In 1960 Cardenas examined the type species of *Hippeastrum Mandonii* Baker at Kew Herbarium and it seemed that our species from Rio Solacama might be *A. mandonii* (Baker) Traub and Uphof. The same year he saw at the Paris Natural History Museum several duplicates of Mandon's collection from Rio Challasuyo, near Sorata, Bolivia, which were not named. After returning to Bolivia Cardenas went to the type locality of *A. mandonii* and collected several bulbs. These bulbs which bloomed in cultivation at Cochabamba, Bolivia, proved to be among the most beautiful *Amaryllis* known from Bolivia if not from anywhere else, but differed from the collection from the banks of the Solacama River. Thus we arrived at the conclusion that the Solacama River plants represent a species

new to science. It has been described above with the following differential characteristics: The flowers are much more regular than those of *A. mandonii*, the red coloration is darker, the flowers are keeled with yellow green on the inner surface of the segments. it is found at nearly 1000 M. lower and in a much warmer and more humid atmosphere.

At a glance the dry herbarium specimens of both taxa seem very similar but a comparison of living materials readily reveals the extent that the more acute flower segments of *A. mandonii* are connivent and all are the color of the Bolivian Flag, that is blood red at the tips, yellow in the center and greenish in the throat. The white margins on the segments of *A. yungacensis* are not present on *A. mandonii*.

A. yungacensis has proved easy to flower in cultivation once it became established. Seed set is readily obtained by using pollen from a different clone from the pod parent. This should prove to be a valuable species for the hybridizer.

It is of interest to point out that with the description of these new species, the number of *Amaryllis* species known from Bolivia numbers over 30, which is a larger number than from any other South American Country.

University of San Simon,
Cochabamba, Bolivia

COMMENTS ON AMARYLLIS PSEUDOPARDINA

With reference to *Amaryllis pseudopardina,* the editor, under date of Aug. 1, 1964, made the following comments in a letter to Dr. Cardenas:

"With reference to *Amaryllis pseudopardina,* this is the closest match with *Amaryllis leopoldii* that has been found up to the present. This species has been lost for almost a century and many have searched for it. The only difference appears to be the color pattern, particularly in the throat. However, such color variations are often found in *Amaryllis* species. Thus, it may be that this plant will later be recognized as *A. leopoldii*. The rediscovery of this species will be hailed as a really important event."

DR. CARDENAS LETTER, AUG. 27, 1964

In reply, under date of Aug. 13, 1964, Dr. Cardenas commented:

"Your comments about *Amaryllis pseudopardina* are very interesting. Really, with the exception of the white bifid bar appearing in the throat of *A. leopoldii*, my new species has all the floral morphology of *leopoldii*. Pearce, as well as the other early collectors of ornamental plants, were obliged by business reasons to avoid the mention of the right places where they found the most valuable plants. According to Pearce, *A. leopoldii* and also *A. pardina*, are from Peru. However, to my knowledge they have not been recollected in that country. On the contrary, at least *A. pardina*, in two varieties, has been found by Prof. Nelson and me as true wild plants in Bolivia. The typical *A. pardina*,

I found in 1959 at Apolo, where Pearce collected. The other variety with stripe-lines instead of dots of blood-red on cream or whitish tepalsegs, was found by Prof. Nelson at Santa Cruz and by me in Yungas of La Paz. In the latter locality, Pearce also collected. But *A. pseudopardina*, comes from Yungas de Corani where according to the itinerary of Pearce, provided for me by Mr. Sandwith from Kew Gardens, Pearce did not enter.

"One striking thing is that years ago while inspecting a large number of commercial *Amaryllis* grown by Mr. Lancaster in Cartago, near San Jose de Costa Rica, I noted that most of the hybrid segregate plants showed flowers of the pattern reminiscent of *A. pseudopardina*.

"Lastly, when I spent a few days at La Paz in June, I saw for the first time flowers of *A. pardina* and *A. vittata tweediana* at the Flower Market. I asked where they came from and I was told that they were gathered from the wild in Yungas of La Paz. The *A. pardina* I saw this time had the appearance of *A. pseudopardina* except for the solid blood-red zone in the middle of the tepalsegs which had instead very dense pencilings of the same colour."

In reply to Dr. Cardenas' letter of August 13, the Editor reported (Sept. 7, 1964) that he wrote to Dr. Sandwith at Kew Gardens for a copy of the Pearce itinerary mentioned by Dr. Cardenas, and received the following reply:

"Replying to your letter of Aug. 20th about a Pearce itinerary reported by Dr. Cardenas, I am afraid that is a slight misunderstanding. There is no such definite itinerary. There are only sheets of foolscap with localities and dates and territories jotted down, as Dr. T. A. Sprague and I found them on herbarium labels, for our private use. These are often used by botanists who visit us, because many of Pearce's localities are so obscure, and it is convenient to look on our little collection to see if any given one is there, and in what country between Ecuador and N. W. Argentina it lies, but our list of course is not complete, is in no sense an "itinerary", and is quite unfit for publication. Believe me, yours sincerely, (signed) Noel Y. Sandwith." Aug. 27, 1964.

The Editor stated further in his letter to Dr. Cardenas (Sept. 7, 1964): "Thus Pearce could have collected in Yungas de Corani. Apparently, he collected only bulbs without flowers and thus there are no herbarium specimens of some of his *Amaryllis* species. We have been looking high and low for anything closely resembling his *Amaryllis leopoldii*, and your *A. pseudopardina* may turn out to be the long missing species."

"From the reported data, *Amaryllis leopoldii* was placed in the subgenus AMARYLLIS by Baker. Thus it will have to be moved to the subgenus AULICA. Baker did not know that it had a pronounced paraperigone."

DR. CARDENAS LETTER, SEPT. 27, 1964

In reply to the editor's letter, Dr. Cardenas wrote under date of Sept. 27, 1964, "the place where this species (*Amaryllis pseudopardina*)

was found by one of my students and where I did travel 10 days ago, is quite out of the regular travel routes. We went by car from Cochabamba to Limbo in the direction of Chapare (124 Km.). From there it was necessary to go by a narrow mule path which was very difficult to negotiate even on foot. I traveled only 10 Km., because the descent was very steep. I sent two students to a place 5 Km. downward. I retraced the 10 Km. back upward to Limbo which took three hours. By evening, the students came back bringing bulbs of *Amaryllis pseudopardina* with flower scapes in bud attached. The next day we returned to Cochabamba. Thus it took three days' journey to collect the precious bulbs. Twenty flowering-sized bulbs were sent by air freight to Prof. Nelson for distribution in the United States."

The bulbs are being distributed by Prof. Claude W. Davis of Baton Rouge, Louisiana. He has notified his customers and long before the members read this note, they will have been exhausted. Thus many will have to wait until seeds are produced which might be sold directly, or they could be planted and sold when the bulblets are large enough. Thus after almost a century, the long lost *Amaryllis leopoldii* has been found.

In an earlier letter (dated Sept. 3, 1964), Dr. Cardenas indicated that the species is located on a quite inaccessible cliff. Thus the members are in debt to Dr. Cardenas for the reintroduction of *Amaryllis leopoldii*.

PLACEMENT OF BULBS

The 22 bulbs sent to the United States by Dr. Cardenas have been placed as follows (Prof. Nelson received two for the collection at the University of Southwestern Louisiana; all others received one bulb):

Prof. Ira S. Nelson, Department of Horticulture, U. S. L., Lafayette, La.
Mrs. H. W. Tucker, 3612 Byron Street, Baton Rouge, La.
Mr. Fred Buchmann, 1766 Avondale Drive, Baton Rouge, La.
Mr. Joseph K. Mertzweiller, North Parkway Drive, Baton Rouge, La.
Prof. Claude W. Davis, 470 Delgado Drive, Baton Rouge 8, La.
Mr. Lewis Lloyd, P. O. Box 19686, New Orleans 19, La.
Mrs. Morris W. Clint, 2005 Palm Blvd., Brownsville, Texas.
Dr. Clair Brown, Dept. of Botany, L.S.U., University Station, Baton Rouge 3, La.
Mrs. Camilla B. Truax, Box 246, St. Francisville, La.
Mr. Earl E. Vallot, Grandview Nursery, RFD, Box 54, Youngsville, La.
Mr. Charles Ramelli, 128 Jeff Davis Avenue, Biloxi, Miss.
Mr. Robert D. Goedert, P. O. Box 6534, Jacksonville, Florida 32205.
Mrs. Alton J. Hoffman, 205 Rees Street, Breaux Bridge, La.
Mr. Hugh L. Bush, P. O. Box 1371, Columbia, S. C., 29202.
Mr. Joe L. Stanley, 2203 West 9th Street, Austin, Texas.
Mrs. A. C. Pickard, 1702 North Blvd., Houston, Texas 77006.
Mr. Everett E. Cook, Box 135, Gulfport, Miss.
Mr. W. D. Morton, 3114 State Street Drive, New Orleans 25, La.
Mr. W. J. Perrin, 4753 Press Drive, New Orleans 26, La.
Mr. James E. Mahan, 3228 Palmyra Street, New Orleans 19, La.
Mr. W. R. Latapie, 3737 Elysian Fields Avenue, New Orleans 22, La.

It is not known if this species is self-fertile. In case it should prove to be self-sterile, those listed may be able to exchange pollen and thus make good such a deficiency, if it should exist.

It is also suggested that the members report on their experiences with this species in future issues of the Amaryllis Year Book.

LYCORIS JOSEPHINAE, SP. NOV.

HAMILTON P. TRAUB

In 1945, Miss Josephine Henry obtained a small-leaved form of *Lycoris* in China. When it finally bloomed here at La Jolla, Calif., in 1964, it was noted that it differs from *Lycoris radiata* var. *radiata*, the biological type, and *L. radiata* var. *triploidia* (the triploid form). When grown under the same soil and cultural conditions here at La Jolla, Calif., the leaves are less upright, and it blooms much later (last days of August through September) as contrasted with *L. radiata* var. *radiata* which blooms in July. It also differs in phenontological characters. The scape is much stouter and taller, the flowers are Delft-rose (HCC-020); the widest leaves are slightly wider than in *L. radiata* var. *radiata*, and they are a deeper green, glabrous, with lighter glaucescent stripe in center, and glaucescent on under side with a glabrous green keel in center. Since the blooming seasons are different, it is reproductively isolated from *L. radiata* var. *radiata*, and it is thus entitled to specific rank. It has been named for Miss Josephine Henry of Gladwyne, Penna., who brought it to the United States.

Lycoris josephinae Traub, **sp. nov.**

A L. radiata var. radiata differt scapo valde robustiore longioreque, floribus "Delft"-roseis, characteribus foliorum, et anni tempo florente tardiore (a ultimis diebus Sextili usque ad finem Septembri).

Rootstock bulbous. *Leaves* several per bulb, narrow, linear, up to 8 mm. wide, deep green, glabrous, with lighter glaucescent strips in center, glaucescent on under side with a narrow glabrous green keel in the center. *Scape* solid, stout, up to 37 cm. tall, reddish in lower ¼, dull greenish above, 9x10 mm. diam. (base), 5x6 mm. diam. (apex). *Spathe* 2-valved, lanceolate, acute, up to 4.3 cm. long. *Umbel* 8-flowered, segs, stamens and style Delft rose (HCC-020), tepalsegs ruffled on the margins, upper ½ decidedly recurved; stamens and style much exserted. *Pedicels* 6-7-9-10 mm. long at anthesis. *Ovary* 6 mm. long, 4 mm. in diam. *Tepaltube* 5 mm. long. *Paraperigone* of 6 single minute rose-colored teeth between the segs at the base. *Tepalsegs* 4 cm. long, 5 mm. wide, acute. *Stamens* and *style* much longer than tepalsegs. *Style* subequaling the longest stamens. Anthers 4 mm. long at anthesis, pollen yellow. *Stigma* minute.

HOLOTYPE: Traub #972 (TRA), 8-29-64, cult., La Jolla, Calif.; from bulbs obtained by Miss Josephine Henry, Gladwyne, Penna., in

China, July 1945, from a soldier on mosquito patrol. He got them from a ledge west of the Min River, not very far from the Hsin Ching Base, almost on the Min River, about 30 miles southwest of Cheng-tu.

SPREKELIA CLINTIAE, SP. NOV.

Hamilton P. Traub

In June 1952, Mrs. Morris Clint obtained bulbs (Clint No. 266) from Mrs. Chester Wheelock of Brownsville, Texas, which had been brought in from Guadalajara, Jalisco, Mexico, in the spring by an employee. Mrs. Clint shared the bulbs with the writer. It was noted that the leaves were linear, glaucous. Although they were given good care they consistently failed to bloom until 1964, when one bulb bloomed on June 17. It was at once apparent that it could not be placed with *Sprekelia formosissima*, the only species in the genus recognized up to the present. The new species has been named for Mrs. Clint in recognition of her important work toward the collecting of the amaryllids of Mexico.

Sprekelia clintiae Traub, *sp. nov.*

Herba bulbosa; foliis glaucis linearibus obtuse acutis; scapo 14 cm. longo; spatha parte 1/3 inferiore connata; umbella uniflora; perigonio leviter irregulari S. formosissimam aliquoversum "vino-rubello" -roseo; pedicello 5.2 cm. longo; ovario 1 cm. longo; segmentis sepalorum 7.2—7.6 cm. longis 1.1—1.4 cm. latis lanceolatis acutis; segmentis petalorum 7.4—8.2 cm. longis 7—9 mm. latis linearibus acutis; staminibus styloque fasciculatis declinato-adscendentibus, segmentos longissimos brevioribus: stylo stamina paulo breviore; antheris versatilibus 6 mm. longis; stigmate breviter trifido.

Holotype: Traub No. 975 (TRA), 6-17-64, La Jolla, Calif., from bulbs obtained originally from Guadalajara, Jalisco, Mexico.

Rootstock bulbous. Leaves several, linear, glaucous, 28.5 cm. long, 1.1 cm. wide at the base, 1.2 cm. wide at the middle, bluntly acute, shallowly chanelled in lower 1/4; contemporaneous with the flowers. Scape 14 cm. long, 6 x 8 mm. diam. (base), 5 x 6 mm. diam. (apex); flattened, roundish edges; greenish, tinged reddish in lower 1/4. Spathe 6.6 cm. long, 7 mm. wide, united for 3 cm. below, free portion above fenstrated slightly near the acute apex. Umbel 1-flowered; flower declinate; perigone slightly irregular in the direction of *Sprekelia formosissima*, color claret rose (HCC-021/1) inside and outside, whitish stripe in lower 1/4 to 1/2 of segs, the whitish stripe wider in the upper seg. Pedicel 5.2 cm. long, 5 x 5 mm. in diam. Ovary declinate, 1 cm. long, 6 x 7 mm. in diam., green, tinged reddish above. Tepaltube very short, 1—2 mm. long. Tepalsegs somewhat irregularly arranged; setsegs 7.2—7.6 cm. long, 1.1—1.4 cm. wide, lanceolate, acute; petsegs 7.4—8.2 cm. long, 7—9 mm. wide, linear acute. Stamens and style fasciculate, declinate-ascending, stamens 6—7.2 cm. long; anthers 6 mm. long at anthesis, versatile; style 8.5 cm. long; stigma shortly trifid.

CRINUM X LAJOLLA CL. 'MARJORIE ANTHES'

HAMILTON P. TRAUB

In the 1963 PLANT LIFE (vol. 19, page 60), a hybrid between *Crinum strictum* var. *traubii* Moldenke ♀ (PLANT LIFE 18: 9-50, 1962) x *Crinum moorei* (tall light pink form) ♂, was named *Crinum* x *lajolla* Traub. The Spanish, "La Jolla" (pronounced "lahoya") means "The Jewel".

The flowers of this hybrid vary from very light pink (almost white) to medium pink, and to a deeper very beautiful Persian rose (HCC-628); and have a delightful fragrance. It is of interest to note that the crossing of a white-flowering with a light pink-flowering plant has given progeny with a much deeper color—Persian rose—not heretofore seen in either species. The plants are of easy culture, evergreen and decorative. It appears worth while to name the best of the Persian-rose-flowering clones so that it may be introduced.

Crinum x **lajolla** cl. 'Majorie Anthes', **new clone**

Similar to the other clones of *Crinum* x *lajolla* Traub, excepting that its flowers are a beautiful Persian rose (HCC-628).

The clone has been named for Mrs. Marjorie Anthes, of Encinitas, Calif., a gardener of outstanding talents.

NATIVE AND INTRODUCED AMARYLLIDS IN ARGENTINA

C. G. RUEPPEL, *Casilla 370, Mendoza, Argentina*

I live in Mendoza Province, which together with San Luis and San Juan Provinces, make up the three "Provinces de Cuyo", a region with similar soil and climatic conditions—the vineyard of my country.

NATIVE AMARYLLIDS

In the wild, the tribe *Zepyhranthes* is generally represented by many interesting species, one of these is the small yellow *Zephyranthes filifolia*, I believe. The tribe *Eustephieae* is represented with a many-flowered, red *Phycella* (?), and 100 kms. northward, in a dry sandy location called, "El Ramblon", grows by the hundreds, *Hieronymiella chlidanthoides* Pax, with its many-flowered scapes of white, scented flowers.

Thus I have plenty of material at home and am preparing notes for future contributions.

INTRODUCED AMARYLLIDS

Recently, 4 medium-sized bulbs labeled "Pancratium" were sent to me from Salta Province, and 2 large bulbs from Jujuy Province, similar to those of subgenus *Ismene* of genus *Hymenocallis*. They were badly injured in digging so that only part of the stems was saved. I placed them in an empty pot in the greenhouse believing that they might rot.

On the way back from Paraguay, where I visited friends in the City of Formosa, the capital of the province of the same name, I obtained some amaryllids. In the wilds of Formosa grow by the hundreds, *Amaryllis elegans* var. (?). There in a friend's garden, I got a very rare bulb—rather large, with opposite, broad, petiolate leaves, dark, shining green. At home, after proper cleaning and disinfection, I rested the bulbs for three months in dry sand in a sheltered room.

In September (early spring here), I placed the "Pancratium" and the "Ismene-type" bulbs in good garden soil with good drainage. In spite of their injury, the latter were in good condition. The petiole-

Fig. 12. *Hymenocallis speciosa;* flowering scape as grown by Dr. C. G. Rueppel in Mendoza, Argentina.

leaved amaryllid from Formosa was placed in an 8-inch pot in rich sandy compost, about Oct. 15, 1963. All four pots were placed in partial shade.

The first to bloom was the "Pancratium", on Dec. 1, 1963 (late spring). The scape when fully developed turned out to be *Hymenocallis expansa* which is native to the West Indies. Thus, at last I had an example of subgenus *Hymenocallis*, with broad sessile leaves, 1 foot long. The umbel was many-flowered, the flowers white, scentless.

The Ismene-type bulbs made sturdy plants. From the basal part (wounded stem), many (about 18)young offsets were produced. Then on Dec. 20, 1963, I had two scapes of *Hymenocallis* (subgenus *Ismene*) *narcissiflora*.

With me *Hymenocallis* x *festalis* usually blooms at the beginning of summer, bearing large many-flowered-scapes, with large, white, scented flowers. I was able to identify these from Dr. Traub's Key to the subgenera of the genus *Hymenocallis*, Plant Life 1962, page 68. This is the hybrid of *H. narcissiflora* and *H. longipetala*, and is known as *H.* x *festalis*, with criss-crossing stamens. The parents are native to Peru.

Contemporarily with *Hymenocallis* x *festalis*, the petiolate-leaved amaryllid obtained from Formosa produced a strong scape, with up to 10 flowers in the umbel. The leaves were well developed at anthesis, wedge-shaped at the base, with well-developed thick petioles 10 cm. long, 1.1 cm. wide, blades 25 cm. long, 9 cm. wide. The scape was flattened with sharp edges, 46 cm. long, 1.7 cm. in diam. (base), 1.1 cm. diam. (apex).

The spathe 2-valved, free, 6 cm. long, 3 cm. wide, and many smaller broadish bracteoles. Ovary sessile, many ovules per cell. Tepaltube 6 cm. long, 2.5 mm. in diam., light green; staminal cup white, 3 cm. long, 2 cm. wide. Filaments and style, white in lower ⅓ green above. Style 3 cm. longer than the stamens; anthers filiform, crescent-shaped; pollen dark orange brown; stigma capitate.

The flowers open one by one, are very long lasting, and thus 10 days later I had a wonderful umbel, measuring a foot in diameter by 17 cm. high. It is delightfully scented all day long. It was hand pollinated but I got only one big, green fleshy seed which unfortunately rotted. The bulb has made no offsets.

Fig. 12 shows the scape in flower which was identified as *Hymenocallis speciosa* from the West Indies and Mexico (see Traub's Key, Plant Life 1962).

CHROMOSOME NUMBER AND MORPHOLOGY IN **TULBAGHIA**

Howard M. Smith and W. S. Flory,

The Blandy Experimental Farm, University of Virginia and Wake Forest College

INTRODUCTION

The genus *Tulbaghia* is much in need of taxonomic revision, and the phylogenetic relationships of this genus, with certain of its relatives, are still unclear. The chromosome morphology and number of available *Tulbaghia* taxa have been studied, and the results are reported here for aid to the eventual solution of the problem.

Agapanthus and *Tulbaghia* are petaloid monocotyledons which are indigenous to Africa. Because of a rhizomatous rootstock, an umbellate inflorescence subtended by two or more bracts, and the presence of 6

stamens, there seems to be little doubt that the two genera are closely related. Most taxonomic systems since that of Bentham and Hooker in 1883 have placed them in the same tribe (Table 1). Baker in 1896 included both genera in tribe Allieae, but most other systematists have considered them sufficiently distinct to separate these two genera in the tribe, or at least subtribe, Agapantheae. Traub in 1963 (Table 1), however, again excluded *Tulbaghia* from Agapantheae, replacing it in Tribe Allieae.

Until the researches of Hutchinson in 1934 (2nd edition, 1959), *Agapanthus* and *Tulbaghia* were considered as members of the Liliaceae. Hutchinson's definition of the families Liliaceae and Amaryllidaceae, however, caused them to be moved to the latter family. He considered the tribe Agapantheae to be the most primitive of the Amaryllidaceae since both *Agapanthus* and *Tulbaghia*, which he includes therein, retain a rhizomatous rootstock which is a dominant characteristic of the more primitive family Liliaceae. Such a root system is suggested in but few other genera of the Amaryllidaceae. Thus these two genera exhibit several characters which make their occurrence as a connecting link between the Lilliaceae and the Amaryllidaceae a tempting postulate. The taxonomic history of *Agapanthus* and *Tulbaghia* is summarized in Table 1.

Table 1. Taxonomic History of **Agapanthus** and **Tulbaghia.**

Authority	Family [1]	Tribe	Subtribe	Genera
Bentham & Hooker (1883)	Liliaceae	Allieae	Agapantheae	**Agapanthus** **Tulbaghia**
Thiselton-Dyer (1894)	Liliaceae	Allieae	.....	**Agapanthus** **Tulbaghia** **Allium** **Massonia** **Daubenya**
Engler & Prantl (1930)	Liliaceae [2]	Agapantheae	.....	**Agapanthus** **Tulbaghia**
Hutchinson (1959)	Amaryllidaceae	Agapantheae	.....	**Agapanthus** **Tulbaghia**
Traub (1963)	Amaryllidaceae [3]	Allieae	Allinae	**Allium** **Nectaroscordum** **Caloscordum** **Steinmannia** **Nothoscordum** **Leucocoryne** **Tulbaghia** **Stemmatium** **Tristagma**
		Agapantheae	.....	**Agapanthus**

[1] Bentham & Hooker (1883) and Thiselton-Dyer (1894) used the category name "Order" rather than "Family".
[2] Engler & Prantl (1930) placed the tribe **Agapantheae** in the subfamily **Allioideae.**
[3] Traub (1963) placed the tribes **Allieae** and **Agapantheae** in the subfamily **Allioideae.**

REVIEW OF CYTOLOGICAL LITERATURE

Index Kewensis (1885-1955) lists 15 species of *Agapanthus*, all of which were described from the Cape area of South Africa. However, there is no general agreement in the literature as to the validity of this

number. Riley and Mukerjee (1962) reported the somatic chromosome numbers and chromosome morphology for 5 putative species and 2 unidentified plants. This is the most extensive cytological treatment of this genus published and the descriptions are referred to in this paper in the discussion of the phylogeny of the tribe. Other cytological studies have been carried out by Darlington (1933), Mookerjea (1955), and Sharma and Sharma (1961). Table 2 lists the known chromosome numbers for *Agapanthus* and *Tulbaghia*.

Cytological accounts of *Tulbaghia* are scanty and deal with only 3 of the 30 species listed by *Index Kewensis*. This genus is distributed throughout southern and tropical Africa. Chromosome reports were made by Whitaker and Flory (1955) and they reported a gametic number of 6 for *T. violacea* and a somatic number of 12 for *T. cepacea* and *T. fragrans*. In 1955 Flory reported that the somatic chromosome numbers for 5 additional, unidentified, taxa were being studied, with chromosome numbers determined. Four of these are listed in Table 2, and the fifth (*T. sp.* 3359-1) was found to have 12 somatic chromosomes. Other cytological studies of the genus were carried out by Mookerjea (1955), Sharma (1956), and by Riley and Hoff (1958) who each dealt, also, with one or more of the above mentioned species. Sato earlier (1942) had reported the number for *T. aloides* (Table 2), a taxon not found listed in *Index Kewensis*.

Table 2. Chromosome numbers in **Agapanthus** and **Tulbaghia**.

Species	2n	Authority
Agapanthus		
campanulatus	30	Riley and Mukerjee, 1962
globosus	30	Sharma and Sharma, 1961
inapertus	30	Sharma and Sharma, 1961
	30	Riley and Mukerjee, 1962
minimus	30	Riley and Mukerjee, 1962
orientalis	32	Riley and Mukerjee, 1962
praecox	32	Riley and Mukerjee, 1962
umbellatus	n=15	Darlington, 1933
	30	Sato, 1942
	30	Mookerjea, 1955
sp. 148/55	30	Riley and Mukerjee, 1962
sp. 71/50	29	Riley and Mukerjee, 1962
Tulbaghia		
aloides	12	Sato, 1942
cepacea	12	Whitaker and Flory, 1955
	12	Riley and Hoff, 1958
fragrans	12	Whitaker and Flory, 1955
violacea	n= 6	Whitaker and Flory, 1955
	12	Mookerjea, 1955
	12, (6, 24)	Sharma, 1956
	12	Riley and Hoff, 1958, 1960
sp. 1851	12	Flory, 1955
sp. 5076	12	Flory, 1955
sp. 7249	12	Flory, 1955
sp. 4698	24	Flory, 1955

MATERIALS AND METHODS

The various taxa of *Tulbaghia* used in this study were secured from private collectors and commercial supply houses. Table 4 lists the source of all of the materials along with the chromosome numbers of those species not reported before.

All chromosome counts and drawings were made from metaphase stages of root tip cells pretreated in .25 per cent colchicine for 5 hours. Following pretreatment, the root tips were fixed in acetic: alcohol 1:3 for 12-24 hours. They were then hydrolyzed for 5 minutes in normal HCl and squashed in 2 per cent aceto-orcein solution. Pressure was applied to the cover glass to obtain maximum flattening of the cells. The slides were then heated over an alcohol lamp to spread the chromosomes and intensify their staining (Darlington and LaCour, 1960). Utilization of the Feulgen reaction was attempted using the method of Flagg (1961) but this seemed to result in the clumping of the chromosomes.

Observations were made from temporary preparations of slides sealed with cover glass cement. Care was taken to use only those cells for study whose walls were intact. An American Optical microscope equipped with a 90x, apochromatic, oil immersion objective (N. A. 1.30) together with paired 15x oculars was used and drawings were made with the aid of a Zeiss camera lucida at a magnification of 2000x. In drawing the chromosomes, the stage was moved slightly so that those chromosomes laying on top of another could be observed without hindrance.

OBSERVATIONS

The chromosomes of 8 taxa of *Tulbaghia* were studied. Camera lucida drawings of metaphase plates and idiograms are given in Figures 13-19.

The chromosomes of *Tulbaghia* vary in the position of the centromere and the placement of secondary constrictions within any given taxon. The chromosomes of the genus are comparatively quite long. Swanson (1957) reports that among the higher plants, monocots generally have larger chromosomes than dicots. Warmke (1941) states that the largest chromosomes of *Trillium* are about 30 microns long. After the pretreatment and fixation described above, the chromosomes of *Tulbaghia* varied from 8.5 microns to 24 microns in length. However, there is no marked variation in length of the chromosomes within any given species. In most species with $2n=12$, there are 3 pairs which cannot be distinguished with any degree of certainty. In the case of those species with $2n=24$, there are 6 pairs which present this same problem. *Tulbaghia* sp. 1698 ($2n=24$) has 11 chromosomes with similar lengths and centromere positions. For that reason, the idiograms with the accompanying figures were constructed by measuring and pairing the chromosomes of 1 cell and the length of the 2 members of each pair were averaged. However, chromosome number and morphology were verified with as many other plates as possible.

Fig. 14. Chromosomes of *Tulbaghia*: (3) *T. cepacea*, 2n=12; and (4) *T. fragrans*, 2n=12. (The chromosomes of this species are morphologically primitive).

The chromosomes were classified by centromere position and the appropriate abbreviations used in the description are given in Table 3. The formulas in the description are for the entire diploid complement. Table 4 lists the chromosome numbers of *Tulbaghia* reported for the first time.

Table 3. Classification of centromere position.

Ratio of short arm to total length	Centromere position	Abbreviation
.50 - .45	Median	M
.44 - .30	Submedian	Sm
less than .30	Subterminal	St.

T. alliacea Linn. 2n=12. The chromosomes of this species fall into 6 morphological types which may be represented by the formula 6M+4Sm+2St. There are 4 chromosomes which have a secondary constriction. Figure 13 (1).

T. cepacea Linn. fil. 2n=12. There are 6 types with a formula of 6M+4Sm+2St. 2 chromosomes have a secondary constriction. Figure 14 (3).

T. fragrans Verdoorn. 2n=12. There are 6 types represented by the formula 6M+6Sm. There are 2 chromosomes with a secondary constriction. Figure 14 (4).

T. leucantha Baker. 2n=12. There are 7 morphological types represented by this species. The formula is 4M+6Sm+2St. The chromosomes are in 5 identical pairs and there are 2 chromosomes which are not alike. There is 1 chromosome with a secondary constriction. Figure 15 (5).

T. leucantha Baker. 2n=24. There are 6 morphological types here with a formula of 8M+16Sm. Four chromosomes have a secondary constriction. Figure 15 (6).

T. ludwigiana Harv. 2n=24. There are also 6 morphological types in this variety. These are given by the formula 12M+8Sm+4St. There are 4 chromosomes which have a secondary constriction. Figure 13 (2).

T. violacea Harv. 2n=12. There are 6 morphological types here with a formula of 8M+2Sm+2St. There are 2 chromosomes with a secondary constriction. Figure 16 (7).

T. violacea var. "Silverlace." 2n=12. There are 6 types represented by this variety which has a formula of 6M+4Sm+2St. There are 2 chromosomes with a secondary constriction. Figure 16 (8).

T. sp. Dyer no. 2042. 2n=12. There are 6 types in this taxon with a formula of 8M+2Sm+2St. There are 4 chromosomes with a secondary constriction. Figure 17 (9).

T. sp. Dyer no. 1851. 2n=12. There are 6 morphological types in this taxon. They have a formula of 6M+4Sm+2St. There are 4 chromosomes with a secondary constriction. Figure 17 (10).

T. sp. Dyer no. 5076. 2n=12. The chromosomes of this taxon represent an unusual situation. There are 2 different karyotypes, each with 7 morphological types of chromosomes. The first—Figure 18 (11)—has

5

6

Fig. 15. Chromosomes of *Tulbaghia*: (5) *T. leucantha*, 2n=12; arrows indicate the heteromorphic chromosomes. In the idiogram these chromosomes are underlined.
(6) *T. leucantha*, 2n=24; a suspected autopolyploid form of the 2n=12 taxon. The chromosome with the very short arm in (5) is not represented in this tetraploid form.

a formula of 6M+6Sm. There is 1 chromosome with a secondary constriction and 1 with 2 secondary constrictions. The other taxon (Figure 18—12) has a formula of 7M+5Sm. There are 2 chromesomes which have a secondary constriction.

T. sp. Dyer no. 4698. 2n+24. The chromosomes are of 6 morphological types in this taxon. The formula is 11M+10Sm+3St. No chromosomes with a secondary constriction have been noted. Figure 19 (13).

Table 4. Unreported chromosome numbers of **Tulbaghia.**

Species	Source	2n
T. allacea	Dr. Walter Lewis South Rhodesia	12
T. ludwigiana	Dr. R. A. Dyer Pretoria, South Africa	24
T. leucantha	Dr. R. A. Dyer Pretoria, South Africa	12
T. leucantha	Dr. Walter Lewis South Rhodesia	24
T. violacea var. "Silverlace"	Oakhurst Gardens Arcadia, California	12

DISCUSSION

Basic numbers in the Agapantheae. The report of Riley and Mukerjee (1962) on the chromosome numbers in *Agapanthus* and the studies of *Tulbaghia* carried out here lead to agreement with Darlington and Wylie's (1955) suggested basic numbers of 15 for *Agapanthus* and 6 for *Tulbaghia.* Of the 12 taxa of *Tulbaghia* studied here, there is none whose 2n number is not ultimately reducible to 6. Riley and Mukerjee (l.c.) studied 7 taxa of *Agapanthus* and of these 4 have diploid numbers which may be derived from a base of 15. (Table 2). Two other taxa have a diploid number of 32 and 1 has a diploid number of 29. Such numbers are not damaging to the idea of a basic number of 15 for the genus. Darlington (1937) has postulated how unequal translocations can lead to the loss or gain of a chromosome, thus changing the number of the basic set. His ideas have been confirmed by the reports of Tobgy (1943) in his studies of the genus *Crepis.* It cannot be categorically stated that such an aneuploid alteration is the case in *Agapanthus* because no meiotic studies of species hybrids have been carried out. However, the assumption is not an improbable one.

Evolution within the tribe. The evidence obtained from chromosome numbers and morphology indicates that *Tulbaghia* is probably not in a euploid series with *Agapanthus.* Since change in chromosome number by ploidy is irreversible, in any euploid series, the most primitive members are those with the lowest chromosome numbers. The morphologically more primitive *Agapanthus* has higher chromosome numbers (2n: 29, 30, 32) than the more morphologically advanced *Tulbaghia* (2n: 12, 24).

Chromosomes of Tulbaghia taxa. The status of *Tulbaghia ludwigiana* Harv. is not clear in the literature. Harvey (1837) described the taxon and gave it specific status but Baker (1896) regarded it as a

Fig. 16. Chromosomes of *Tulbaghia*: (7) *T. violacea*, 2n=12; and (8) *T. violacea* var. 'Silverlace', 2n=12.

Fig. 17. Chromosomes of *Tulbaghia*: (9) *T.* sp. Dyer no. 2052, 2n=12; and (10) *T.* sp. Dyer no. 1951, 2n=12.

Fig. 18. Chromosomes of *Tulbaghia*: (11 and 12) *T.* sp. Dyer no. 5070, 2n=12. Heteromorphic chromosomes are indicated by arrows and underlined in the idiogram. Possibly 2 chromosome races are present here.

variety of *T. alliacea*. The diploid number in *T. ludwigiana* is 24 and there are 6 morphological types of chromosomes, each represented 4 times in the karyotype (Figure 13—2). *T. alliacea* (Figure 13-1) has only 12 chromosomes in the diploid complement but there are proportionately the same number of medianly, submedianly and subterminally constricted chromosomes in both the diploid and the tetraploid. The geographical distribution of the two taxa coincide and it is therefore possible that *T. ludwigiana* has been derived from *T. alliacea*. If that is the case, there is a discrepancy in the number of chromosomes with secondary constrictions in *T. ludwigiana*.

Fig. 19. Chromosomes of *Tulbaghia*: (13) *T.* sp. Dyer no. 4695, 2n=24. The chromosomes have no secondary constrictions and few subterminal centromeres.

However, there is evidence that the number of satellite chromosomes is a most unreliable indication of ploidy (Stebbins, 1950). The possibility

that *T. ludwigiana* might have been derived from some other taxa and is an allopolyploid cannot be ruled out since the chromosome morphology of the other taxa of *Tulbaghia* studied here is quite similar. The fact that there are distinct morphological differences between *T. alliacea* and *T. ludwigiana*, as well as cytological differences, indicates that the latter might be deserving of specific status.

There are two levels of ploidy represented by *T. leucantha* (Figs. 5 and 6). Members of this taxa from South Africa have a 2n number of 12 and those from South Rhodesia have a 2n number of 24. There do not seem to be any significant morphological differences between the two taxa and the fact that they have different chromosome numbers does not seem to warrant their separation into different species at the present time.

The chromosomes of *Tulbaghia* sp. 5076 (Figs. 17-10 & 18-11) are quite distinct. Unfortunately, the material from which these drawings were made is no longer available and morphological data was not taken. If the plants are of the same species, there are 2 distinct chromosome races present and meiotic studies of crosses between the 2 races would provide valuable information as to their origin.

Sharma (1956) reports variation nuclei in *Tulbaghia violacea* with numbers of 6 and 24. He postulates that such aberrant forms may eventually give rise to new species in plants which are vegetatively propagated. These observations were not confirmed in this study.

An unusual feature of the chromosome morphology of the tribe is concerned with secondary constrictions. Sato (1942) reports that 2 chromosomes in the diploid complement of *Agapanthus umbellatus* have secondary constrictions. Mookerjea (1955) reports 10 chromosomes with secondary constrictions in the same species. The 1962 work of Riley and Mukerjee in *Agapanthus* records no chromosomes with secondary constrictions as having been observed either in *A. umbellatus* or any other taxon of the genus. By referring to Figures 13-19, it may be seen that in every species of *Tulbaghia* investigated here (with the exception of *T.* sp. 4698) there are chromosomes with secondary constrictions.

Stebbins (1950) reports that very little is known about the evolutionary changes in satellites, but that they may be either lost or gained during evolution. Since the chromosomes of *Agapanthus* have few or no secondary constrictions, while the morphologically closely related *Tulbaghia* has secondarily constricted chromosomes in almost every species, this general problem seems deserving of still further investigation.

SUMMARY

Previously unreported chromosome numbers are presented for 5 taxa of *Tulbaghia*, including two species not heretofore studied cytologically.

Detailed chromosome drawings and idiograms are included here for *Tulbaghia* species: *alliacea*, *cepacea*, *fragrans*, *leucantha* (both 2n and

in forms), *ludwigiana* and *violacea*, as well as for a variegated form of the latter. In addition drawings and idiograms are presented for the chromosomes of 4 as yet unidentified taxa of *Tulbaghia*. Chromosomes are characterized by being long and often distinctive. One or two pairs of chromosomes with distinctive secondary constrictions are features of the complements of all but one of the taxa studied.

The data are considered in relationship to the phylogenetic position of *Tulbaghia*, and its relationship to *Agapanthus*, with the need for still further study of this general problem being pointed out.

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ON THE KARYOLOGY AND PHYLOGENY OF SOME GENERA OF THE AMARYLLIDACEAE

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Quite a number of authors, e.g. Taylor (1925), Sato (1942), Gouws (1949), Mookerjea (1955), Sharma and Ball (1956), Ising (1962) and Wilsenach (1963), have investigated members of the family *Amaryllidaceae* cytologically. At least some species of most of the genera have already been studied, and of the South African representatives only *Hessea*, *Strumaria*, *Gethyllis*, *Klingia* and *Apodolirion* are still cytologically unknown. In the present study one species of each genus is investigated cytologically and idiograms are compared. This information is correlated with morphological data and some suggestions are made about phylogeny of the genera concerned.

MATERIAL AND METHODS

The species were collected in their natural habitat and transplanted into a sandy loam in 4 inch pots. The root tips of *Hessea* and *Strumaria* were fixed in Craf (Randolph, 1935) for 24 hours and embedded in wax. Sections were cut 16—18 microns thick, and were stained in crystal violet, using the method of Smith (1934). The root tips of the other three genera were fixed in 3 alcohol: 1 acetic acid for about 30 minutes and were then macerated in a mixture of equal volumes of concentrated hydrochloric acid and 95% alcohol. The cells were subsequently hardened in a 6:3:1 solution of acetic acid, alcohol and chloroform, and the squashes were stained in acetocarmine, making them semi-permanent by sealing the edges of the coverslips with nail varnish.

When the idiograms are compared, it must be remembered that chromosomes after acetic-alcohol fixation are about 25% longer than after Craf fixation (see Wilsenach, 1963). The rather great difference in chromosome length between *Hessea* and *Strumaria* chromosomes on the one hand, and those of *Gethyllis*, *Klingia* and *Apodolirion* on the other hand, is partly due to the differences in the methods of fixation.

RESULTS

The chromosomes are described as V-, L- and f-shaped depending on the position of the primary constriction: V for a median constriction or one nearly so, L for submedian and f for a subterminal constriction, i.e. where the proximal arm is less than a third of the length of the distal arm. Although the primary constrictions were very clear, especially after acetic-alcohol fixation, the secondary constrictions could not be seen in any of the material investigated. The chromosomes are arbitrarily divided into long (l), medium (m) and short (b, brevis). This system was also used by Gouws (1949), and Wilsenach (1963), and is used here to facilitate comparison with these results.

At least three metaphase plates of each species were investigated in order to determine chromosome number and to compute the idiograms (see Figs. 20 and 21).

Fig. 20. Chromosome morphology in the species *Gethyllis afra* (A), *Klingia namaquensis* (B), *Apodolirion buchananii* (C), *Hessea zeyheri* (D), and *Strumaria truncata* (E).

A. *Gethyllis afra* Linn. *2n=12.*
Genome formula:— 1 (one) l V; 1 (one) l f; 2 mf;
1 (one) mL; 1 (one) b V.
The longest chromosome is 21 microns long, the shortest 7.5 microns.

B. *Klingia namaquensis* Schoenl. *2n=12.*
Genome formula:— 1 (one) l V; 1 (one) l f; 3 mf;
1 (one) b V.
Chromosome A is 23 microns long, the shortest chromosome has a length of 7.5 microns.

C. *Apodolirion buchanani* Baker *2n=12*
Genome formula:— 1 (one) l V; 1 (one) l f; 3 mf;
1 (one) b V.
Chromosome A: 31 microns; Chromosome F: 7 microns.

D. *Hessea zeyheri* Baker *2n=24*
Genome formula:— 1 (one) l V; 1 (one) l L; 2 mV; 3 mL;
2 b L; 2 b V; 1 (one) bf.
Longest chromosome 9 microns long, shortest one plus or minus 3 microns.

E. *Strumaria truncata* Jacq. *2n=22*
Genome formula:— 1 (one) l L; 4 mL; 1 (one) mf; 2 mV;
1 (one) bL; 1 (one) b V; 1 (one) bf.
The longest chromosome is 12 microns long, the shortest has a length of less than 5 microns.

DISCUSSION

Most authorities agree that the family *Amaryllidaceae* is derived from the *Liliaceae*. In the *Liliaceae* many chromosome numbers have been reported, but 2n=24 is a common one (e.g. *Fritillaria, Lilium, Notholirion* and *Tulipa*). Very few have 2n=12 (e.g. *Kniphofia* and *Ornithogalum*), but it is possible to consider 2n=12 as the original basic number, and to consider 2n=24 as the result of polyploidy.

Tulbaghia has an umbellate inflorescence but superior ovary and can be considered as a link between the two families. It is characterised by 12 somatic chromosomes (Whitaker and Flory, 1955).

It is interesting to note that *Gethyllis, Klingia* and *Apodolirion* also have 12 somatic chromosomes and it is suggested here that this represent the original basic chromosome number for the *Amaryllidaceae*. *Zephyranthes*, too, has been reported as having 6 as the haploid number, but in this genus polyploid species also occur (Sato, 1938; Sharma & Ghosh, 1954). It is interesting to note that Hutchinson (1959) has grouped *Gethyllis and Apodolirion* and *Zephyranthes* in one tribe, the *Zephyrantheae*, and this classification is supported here by cytological data. Unfortunately Hutchinson (1959) separated these genera from *Klingia*, which he put into a completely different tribe. If the idiograms of *Gethyllis, Apodolirion* and *Klingia* are compared one notices that they are so similar that it seems unreasonable to separate these genera into different tribes. It is suggested here that Hutchinson's scheme is unnatural in this aspect, and that *Klingia* also should be included in the *Zephyrantheae*. This tribe is by no means primitive, but it is considered here as having retained the original basic number (6) of the family.

Hutchinson (1959) as well as Pax & Hoffman (1930) group the genera *Hessea* and *Strumaria* in the *Haemantheae* (or *Haemanthinae*),

which separates them completely from the genus *Nerine*. That the genus *Hessea* is closely related to the genus *Nerine* can be demonstrated as follows: The karyotype of *Hessea zeyheri* is remarkably similar to that of *Nerine filifolia* (for karyotype of latter see Gouws, 1949). Not only does this indicate the affinity of the two genera, but *N. rehmannii* has long been regarded as a plant belonging to the genus *Hessea*, until Bolus (1930) demonstrated that in this plant the anthers are basifixed. Another distinguishing character is that the stamens in *Hessea* are spread, but this is not unknown amongst the *Nerines*. It is therefore suggested that *Hessea* be included with *Nerine* in the same tribe and not the *Haemantheae* (or *Haemanthinae*) as proposed by Hutchinson. A study of the karyotype of *Strumaria* likewise suggests that this genus also should be here included. Morphologically and karyologically *Strumaria* and *Hessea* appear to be closely related. Obermeyer (1963) expressed doubt as to whether they should be considered as two distinct genera.

Basing his ideas on karyological and morphological data, Gouws (1949) included the following genera in the one tribe: *Boöphone* (2n=22). *Nerine* (2n=24, 22,), *Brunsvigia* (2n=22). Amaryllis (2n=22), *Crinum* (2n=22), *Ammocharis* (2n=22), and *Cybistetes* (2n=22). If *Hessea* and *Strumaria* are added to this tribe (Amaryllideae) the following picture emerges: The primitive genera having free perianth segments or a short perianth tube have 22 or 24 chromosomes, and the members which are more advanced (with a distinct perianth tube) have 22 chromosomes.

In the earlier discussion 2n=24 was explained in terms of polyploidy from a 2n=12 ancestor. If this interpretation is accepted the origin of the tribe Amaryllideae involved polyploidy from 2n=12 stock, while the species and genera with 22 somatic chromosomes arose by loss of a pair of chromosomes.

Pax and Hoffman (1930), when discussing the anatomy of the peduncle of the Amaryllidaceae, pointed out that two types occur: In some the ground tissue is wholly composed of parenchyma, in others a definite ring of sclerenchyma tissue occurs. They noticed that some genera were characterized by the sclerenchyma ring even though the flowers were small or few, and in other genera many big flowers were borne on an axis without sclerenchyma. They came to the conclusion that the presence of the sclerenchyma could not be explained on the basis of mechanical function, and suggested that it may be a character of some phylogenetic importance. All the amaryllid genera were not available to Pax and Hoffman for peduncle studies, and when the peduncles of the South African representatives were investigated by the present author, it was very interesting to note that all the genera which had sclerenchymatous peduncles are grouped together in the tribe Amaryllideae as suggested above.

The genera lacking sclerenchyma are *Haemanthus*, *Clivia*, *Cryptostephanus* and *Cyrtanthus* (including the genera *Anoiganthus* and *Vallota*). The possibility that these genera belong to one tribe, the

Haemantheae, can also be supported on cytological grounds, but their relationships are not discussed in this paper.

Fig. 21. Idiograms for the species (upper) *Gethyllis afra* (A), *Klingia namaquensis* (B), *Apodolirion buchananii* (C), and (lower) *Hessea zeyneri* (C), and *Strumaria truncata* (D).

A NEW CONCEPT FOR THE GENUS GETHYLLIS (SEE FIG. 21.)

Different *Gethyllis* species show great variation as regards their stamens (the number varies from six to many and the anthers per stamen vary from two to five). *Klingia* is considered as being distinct from *Gethyllis* because three filaments in *Klingia* widen out to form a staminal cup. *Apodolirion* is maintained as a separate genus because the stamens occur in two series whereas they occur in only one series in *Gethyllis*. It almost seems anomalous to maintain three genera on the basis of stamen characters and to accept at the same time that the stamens of one of the genera are quite variable.

It is interesting to compare the above differences with variation which has been demonstrated to occur within another amaryllid genus, *Cyrtanthus*. *Cyrtanthus herrei* was formerly considered as belonging to the genus *Cryptostephanus* on the basis of a staminal cup which is formed by fused filaments. Dyer (1959) combined this species with *Cyrtanthus* (in which no staminal cup is normally present) and suggested that such variation could occur within one genus. His decision was supported by subsequent karyological data (Wilsenach, 1963). The difference on which *Klingia* and *Gethyllis* are separated has therefore been demonstrated to occur *within* another amaryllid genus.

In *Cyrtanthus* species occur in which the stamens are in one series, other species have stamens in two series, and it is not disputed that they belong to one genus. It is inconsistent to separate two other genera (*Gethyllis* and *Apodolirion*) on this basis only.

When the idiograms of *Klingia*, *Gethyllis* and *Apodolirion* are compared one notices remarkable similarity: In all three chromosome A is V-shaped; chromosome B has the longest distal arm; chromosomes C and D have distal arms of the same length; chromosome D has the shortest proximal arm and the shortest chromosome is V-shaped; chromosome E is the only one showing a little variation, in that the centromere is a little further away from the one end in *Gethyllis* than in the other two genera. These idiograms show much less variation than is commonly seen within a genus in the *Amaryllidaceae* (see e.g. Wilsenach, 1963).

From the above it should be clear that *Gethyllis*, *Apodolirion* and *Klingia* are maintained as separate genera for very debatable reasons. The great karyological similarity of these three genera is a strong indication that they belong to one genus, and it is suggested here that they should be merged into one genus, namely *Gethyllis*, which was described first. All that is involved is to describe the androecium of the genus as follows:

Stamens from six to many, usually occurring in one series, rarely in two series; filaments may widen to form a staminal cup; two to five anthers per stamen, anthers basified, linear and often twisted or curved.

SUMMARY

The Karyotypes were studied and the following chromosome numbers were reported: *Gethyllis afra*, 2n=12; *Klingia namaquensis*, 2n=12; *Apodolirion buchananii*, 2n=12; *Hessea zeyheri*, 2n=24; *Stru-*

maria truncata, 2n=22. It was suggested that *Klingia* and *Apodolirion* are congeneric with *Gethyllis*, and that this genus should be included in the tribe Zephyrantheae. The genera *Hessea* and *Strumaria* are closely related to *Nerine* and it was proposed that they should be included in the tribe *Amaryllideae*. The origin of this tribe was considered to involve polyploidy from a 2n=12 ancestor. The diploid number of 12 (or x=6) was suggested as the original chromosome number of the *Amaryllidaceae*, and this number has been retained in the tribe *Zephyrantheae*.

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EDITORIAL NOTE.—Prof. Wilsenach did not have access to the publication, "The Genera of Amaryllidaceae" (1963) by Hamilton P. Traub. Thus in his discussions he refers only to treatments of the *Amaryllidaceae* published before 1963. Prof. Wilsenach will publish a follow-up article in the 1966 PLANT LIFE in which he will discuss his present and any additional results in relation to "The Genera of Amaryllidaceae" (Traub, 1963), and the addenda note by Hamilton P. Traub in the 1965 PLANT LIFE (pages 88-89).—*Hamilton P. Traub.*

ADDENDA TO TRAUB'S "THE GENERA OF AMARYLLIDACEAE" (1963)

Hamilton P. Traub

When the text of "The Genera of Amaryllidaceae" (Traub, 1963) was prepared the chromosome numbers of the Amaryllid genera of the

Trans-Saharan African Region (East- and West-Central, and South Africa) were minimally known, excepting for the genera *Choananthus, Gethyllis, Apodolirion, Klingia, Hessea, Carpolyza, Strumaria and Chapmanolirion.* Wilsenach (1965) in the present issue of PLANT LIFE has given a minimal report on the chromosomes of most of these genera—*Gethyllis, Apodolirion, Klingia, Hessea and Strumaria.* On the basis of this report, the following dispositions can be made:

(1) The tribe *Strumarieae,* including *Hessea, Carpolyza,* and *Strumaria,* can be merged with the tribe *Crineae* (see Table 1.).

(2) Chromosome evidence has to be used in conjunction with morphological and other data. It is not known if Wilsenach (1965) has seen the fruit of *Klingia,* and thus this information may be missing. However, the genus *Klingia* can be placed in the tribe *Gethylleae,* along with *Gethyllis* and *Apodorlion,* tentatively (see Table 1) awaiting verification of the fruit character.

1a. Filaments free, fruit an elongated berry ..... **Gethyllis** (incl. **Apodolirion**)
1b. Filaments united below into a staminal cup, fruit unknown ..... **Klingia**

This leaves only the genera *Choananthus* and *Chapmanolirion* to be accounted for on the basis of chromosome number and morphology. The type of *Chapmanolirion* may be *Pancratium trianthum* (see Traub, 1963). If this can be verified, then it will become a synonym of *Pancratium.*

Table 1, incorporating the data reported by Wilsenach (1965) is furnished for the information of the members of the Society. Thus the missing parts of the amaryllid chromosome atlas are gradually being fiilled in.

Table 1. Chromosome numbers in **tribes** of the Amaryllidaceae containing genera native to the Trans-Saharan African Legion (East- & West-Central and South Africa.)

Tribe ALLIEAE, x=5, 6, 7, 8, 9, 10, 13?
Subtribe 1. ALLINAE, x=6, 7, 8, 9, 10
Allium 2n=14, 16, 18, 24, 28, 32, 40; (cosmopolitan in No. Hemisphere to Mexico and No. Afr.)
Nectaroscordum 2n=16 (E. Asia)
Caloscordum 2n=16 (E. Asia)
Steinmannia 2n=? (So. Amer.)
Nothoscordum 2n=16, 18, 24 (No. Amer. and So. Amer.)
Leucocoryne 2n=18 (So. Amer.)
Tulbaghia 2n=12, 24 (So. Afr.)
Stemmatium 2n=? (So. Amer.)
Tristagma 2n=12 (So. Amer.)
Subtribe 2. BRODAEINAE, x=5, 6, 7, 8, 9 (No. Amer.)
Subtribe 3. MILLINAE, x=13? (No. Amer.)
Tribe AGAPANTHEAE, x=15 **(So. Afr.)**
Tribe CRINEAE, x=6, 11 (including tribe Strumarieae)
Ammocharis 2n=22 (So. Afr.)
Crinum 2n=22, 22+2B, c.72 (cosmopolitan No. & So. tropical and adjacent temperate zones)
X Crinodonna 2n=? (bigeneric hybrid)
Nerine 2n=22, 24 (So. Afr.)
Hessea 2n=24 (So. Afr.)
Strumaria 2n=22 (So. Afr.) (including **Carpolyza**)
X Brunserine 2n=? (bigeneric hybrid)
Boophone 2n=22 (So. Afr.)
Cybistetes 2n=22 (So. Afr.)
Brunsvigia 2n=22 (So. Afr.)
Tribe GETHYLLEAE, x=6
Gethyllis 2n=12 (incl. **Apodolirion**) (So. Afr.)
Klingia 2n=12 (So. Afr.)
Tribe HAEMANTHEAE x=8, 9
Haemanthus 2n=16, 18 (E. Cent. So. Afr.)
Choananthus 2n=? (E. Cent. Afr.)
Tribe CLIVIEAE, x=6, 11
Clivia 2n=22 (So. Afr.)
Cryptostephanus 2n=24 (So. Afr.)
Tribe CYRTANTHEAE, x=8, 11
Anoiganthus 2n=16 (So. Afr.)
Cyrtanthus 2n=16, 22 (incl. Vallota) (So. Afr.)
Tribe PANCRATIEAE x=11
Vagaria 2n=? (Asia Minor)
Pancratium 2n=22, 44 (Canary Is., Medit. Region to India and So. Afr.)
Chapmanolirion 2n=? (So. Afr.)

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NOTHOSCORDUM—THE UBIQUITOUS AMERICAN

THAD M. HOWARD, JR., *D. V. M., Route 1, Box 524, 9138 San Pedro Ave., San Antonio 12, Texas*

The Bible teaches us that the meek shall inherit the earth, but surely the genus *Nothscordum* was not meant to be included in this statement, for there is really nothing meek or shy about a few notable members of this interesting genus. Both *N. bivalve* and its cousin *N. inodorum* are well equipped to inherit the earth, given the opportunity to do so, with practically no encouragement. If one judges flowers by only their impressive colors and dimensions, then *Nothoscordum* is a meek little mouse indeed, but like the mouse, it is persistent, rugged, adaptable, and quietly aggressive. This is not meant to convey to the reader that I have any lack of love for these tough little gamins, for in truth I do admire it and am rather fond of its sometime virtues. Presently at least 17 species are recognized, which are widely distributed from Ohio and Virginia Southward to the Gulf states and Westward to Texas and down into Mexico and South America. It is in South America where they are best represented, with some fifteen or so species recognized. It is hoped that the others from South America are less inclined to run rampant. None, excepting *N. inordorum* are known to be in general cultivation in the countries above the equator at this time, though no doubt a few of them would be choice garden material. Apparently Nothoscordums replace Alliums in South America, as no Alliums occur south of Central Mexico. Unlike Alliums, Nothoscordums in their vegetative parts lack the characteristic onion or garlic odor and are relatively odorless and tasteless. Indeed the word *Nothoscordum*, translated, literally means "not a garlic". As a group, most species are monotonously colored white, or whitish, with occasional markings of violet, yellow, or green, but there are several species said to have bright golden yellow flowers, and one species is said to be lilac colored. In general they have umbels of 2 or more flowers per scape, and some are dwarf while some are tall and wiry.

Nothoscordum bivalve is undoubtedly the best known member of the genus and also the most widely distributed. It grows in roughly 25% of the United States, North to Ohio and West to W. Texas. I know of no other native bulbous plant that has adapted itself to such a widely varying environment. It thrives at mile high elevations as easily as it does at sea level. Neither high humidity nor semi-arid conditions bother it. It will adapt itself to tropical conditions and will survive subzero temperatures with equal disdain. A rampant seeder, it offsets freely too, so that a single bulb can quickly become an established colony where conditions permit. In its defense, it must be stated that it is no worse than some other equally rampant spreaders such as *Orinthogalum umbellatum*, *Muscari* species, and many *Alliums*, to name a few of our garden favorites. What then, are its virtues, if any? True, it is pretty enough, in an unimposing way. The loosely arranged umbels of starry cream-white flowers are not at all unattractive when seen at their best.

Often they are keeled with a stripe of green, brown, or purple on their backside which adds a bit of color to the individual flowers. These little stars are each about ¾″ across the face, and the anthers, filaments, ovary, and base of each segment are tinged greenish-yellow, and are each carried on a pedicle from 1-2″ from the center of the umbel. The umbels may rise on stems from ten inches to two feet above the leaves. A single bulb may send forth scape, after scape, continuously from February until June, with no letup. After a brief summer of dormancy, they will flower again in the fall, until winter really sets in. Under cultivation, a few will refuse to go dormant and flower throughout the summer. Thus it is quite possible for them to flower 9-10 months of the year where climate and conditions permit. And that is not all! They are very sweetly fragrant, with perfume suggesting *Heliotrope.*

A group of *Nothoscordum bivalve* swaying on wiry stems above shiny green grassy leaves on a warm sunny afternoon in spring or fall can be a pleasant experience to the olfactory senses as their perfume is wafted through the air. I can recall pleasing moments as a child-home-from-school, sitting out in the lawn among the entrenched *Nothoscordum bivalve* colony and enjoying the pervading fragrance. What cared I if these "wild onions" did not belong there and were uninvited residents? The smell of them in the early evening air was delicious. I would pick handfuls of them and stick my nose into the masses of yellowish white blooms to drink deeply of the scent. The yellow pollen dusted my nose and face! Such are the joys of children. Later, as I began to acquire an interest in bulbous things, these were the first bulbs to go into my garden. I recall digging them from the lawn and leaving ugly blemishes in my wake. Mother, though patiently tolerant, was unimpressed. Thereupon I would gather a bunch of the stems for her to smell. She was agreeably surprised, but still not convinced. But even to this day, she has never been too impressed with most of my "little bulbs" that I grow, so it was really no reflection on my beloved Nothoscordums. Even now, when I find a person cautious to praise this plant's unpretentious qualities, I still gather a bunch of them and let them smell. It never fails. Who can fail to be charmed or delighted by a fragrant flower. To be so jaded is to miss some of life's real pleasures. The generous blooming habits, with an autumn reprise, its delicious fragrance, its modest prettiness, its zeal for living, these are its endearing qualities. Like the dog, it joyfully seems to be wagging its tail, licking our boots, and asking for nothing in return, save a pat of appreciation. Surely we can offer it a sunny nook somewhere where it can be left to colonize at the expense of no one. It should be a charter member in any garden set aside for wildings. If set deeply, to a depth of six or more inches, it need never be divided, as increased depths inhibit offsetting. Fastidious gardeners who don't allow any plants to set seed voluntarily can even plant it in a choice position. *Nothoscordum bivalve* grows everywhere in Mexico, and is said to grow into Guatemala.

Nothoscordum inodorum (syn.—*N. fragrans*) is a taller cousin of *N. bivalve,* of more robust growth habits, and even more sweetly scented

flowers, if that can be. Though slightly less hardy, and less able to withstand dry conditions than its tough cousin, it is even more rampant a spreader, and this must be very carefully watched lest it become an unwelcome guest. Unlike *N. bivalve* which has narrow grassy leaves that are never untidy, the foliage of this larger *Nothoscordum* is much broader and longer, of a dull bluish green color, and apt to sprawl. It is for this reason that one must choose a place for it with care, so that it does not smother other smaller things, as well as choke them out with its numerous seedling offspring. If one chooses to cultivate it, all flower stems should be removed as quickly as they fade, so that it will not set seed. Its quaintly charming umbels of whitish flowers with their intense fragrance are simply not enough to offset or compensate for its numberless seedling offspring that insist on taking over every inch of adjacent garden space. It is a plant only for wild gardens. Much as I would like to do so, I cannot eulogize this plant. If *N. bivalve* is like a friendly dog, then *N. inodorum* is a dog that bites the hand that feeds it. Look out! "Pretty is as pretty does."

There is not much point in discussing all of the South American Nothoscordums, as they are not in cultivation, nor are they available here. No doubt there are some that are choice within the group, and fairly adaptable to our culture. It is likely that those from higher altitudes should prove fairly hardy. Uruguay seems to be the center of the *Nothoscordum* clan, with most species being found there. Others are found in Chile, Paraguay, Peru, Bolivia, and Argentina. Any discussion of these exotics should begin with those that seem most appealing as garden plants, and the yellow flowered species would be my first choice. *N. graminicum*, has many flowered umbels of yellow flowers on stems 3-6 inches tall. This one should prove easy, as it is said to grow from Argentina to Mexico. That is a lot of territory! *N. minarum* has taller stems 6-12 inches tall, but few flowered umbels of yellow flowers. It is one of the many species from Uruguay. *N. bonariense*, another yellow Uruguayan species, has slender stems with only one or two flowers, or more rarely three or four flowers, less than a foot tall. Sometimes the flowers are said to be white with brown veins.

The light lilac flowers of *N. andicola* top dainty 3-6″ stems and are a refreshing departure from the many white kinds. This Andean species seems to be wide spread in the countries of the Andean region. The white flowers of *N. gaudichadianum* with their violet veins in 3-6 flowered umbels on stems under a foot in height whet the imagination of the enthusiast collector. It too is from Uruguay. Two *Nothoscordum* species have such short stems as to be practically stemless. Both the white *N. fictile* and *N. sessile*, with their one flowered scapes must appear like starry crocuses squatting on the ground. They surely are a departure from a family which mimics the onion family. These are but a few of the species within the genus, but it will at least point out the fact that there are still many interesting plants yet to be had. Let us hope that some day these will be made available to us. We might further hope that they will not violate their welcome in the fashion of *N. inodorum*.

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RECORD KEEPING BY PLANT COLLECTORS

Hamilton P. Traub

Such experienced plant collectors as Mrs. Morris Clint, and Dr. T. M. Howard, keep adequate records of their plant finds, and this note is not meant for such veteran collectors. It is aimed at those who have recently entered the field and as yet do not keep adequate records. The writer has received seeds and bulbs without any definite record of the place and time of collection, or any other notations. This is most unfortunate because the scientific record is forever inadequate.

Most collectors obtain handy smaller bound memorandum books which they can carry into the field. The various lots are numbered consecutively from No. 1 upward, using one number for each lot taken in a different habitat, even if it is the same species. In this way confusion is avoided because each number will appear only once for any one collector.

After each number, he enters the date of collection, sometimes even the time of day, the name of the plant, if known, or probable (?) identity, or the space is left blank as to species, if unknown. He also enters the altitude, if known, the geographical location, the ecological conditions, soil, rainfall, etc., and notes on plant characters obtainable at the time.

When any part of the lot is sent to another person, the collection number is given with it. In this way all who work with the material can refer back to the original collection number for further details. For instance, Mrs. Clint sent the writer stock of a glaucous-leaved amaryllid, probably a *Sprekelia* (?), Clint No. 266, in 1952. When flowers were finally obtained 12 years later in 1964, it was easy to write to Mrs. Clint for more information about this lot so that the plant could be published as the new species, *Sprekelia clintiae*, in the present issue.

Fig. 22. *Hymenocallis fragrans* as grown at the Los Angeles State and County Arboretum, Arcadia, Calif. The petioled leaves had begun to decline but are still attached to the bulb. Photo by Wilfred M. Noble.

HYMENOCALLIS FRAGRANS FROM SEED

W. Quinn Buck
Los Angeles State & County Arboretum
Arcadia, California

In May of 1960 seeds were received under the name "*Hymenocallis expansa*" from the Hortus Botanicus, Groningen, Holland.

These seeds were planted at the Arboretum, and one seedling made slow progress through the years until June 1964, when it produced the magnificent flower scape pictured. Dr. Hamilton P. Traub has identified this wonderful species as *Hymenocallis fragrans* (Salisb.) Salisb., in Trans. Hort. Soc. 1: 340. 1812, excel. Trew, Sel. pl. 28, using photographs furnished by us for the identification (see Fig. 22).

Besides the outstanding beautiful flowers with their strong fragrance, the most outstanding characteristic of this rare species is the foliage, which is distinctly petioled and in that way quite different from any of the species which are commonly grown.

According to Dr. Traub, this beautiful species is native to the West Indies, where it grows commonly among hills near the coast on the Island of Barbados. It differs from *Hymenocallis speciosa* (Salisb.) Salisb., in Trans. Hort. soc. 1: 340. 1812, excel. Redouté, Lil. pl. 156, mainly due to its shorter, narrower, leaf blades.

AMARYLLID NOTES, 1965

Hamilton P. Traub

X Sydneya morrisii hybr. nov.

In the 1963 Plant Life, pp. 73-74; 34, Mrs. Morris Clint, of Brownsville, Texas, reported briefly on a new bi-generic hybrid between *Habranthus immaculatus* (seed parent) and *Zephyranthes bifolia* (pollen parent). In November 1964, Mrs. Clint sent a pressed specimen to the writer, and the description is based on this Holotype; and information reported by Mrs. Clint:

Leaves strap-shaped, up to 34 cm. long, 1.2 cm. wide, apex bluntly-acute; scape 31 cm. long; umbel 1-flowered, pedicel 5.6 cm. long, ovary 8 mm. long, 4 mm. in diam.; tepaltube 1.1 cm. long, tepalsegs 6.5 cm. long, narrowly oblanceolate, up to 1.5 cm. wide; flowers resembling *Habranthus immaculatus* in size and shape, color carmine rose (HCC-621) to Neyron rose (HCC-623), white center, and a small green throat; stamens and style shorter than the tepalsegs; stamens shorter than the style, of 2 sets of lengths; stigma trifid, with lobes markedly recurved.

Herba bulbosa; foliis loriformibus usque ad 34 cm. longis, 1.2 cm. latis, apice obtuse acutis; spatha in tubam infra connata, parte libera fenestrata vel bifida; flos illam Habranthi immaculati magnitudine figuraque consimilis carmineo-roseus (HCC-621) usque ad "Neyron"-roseus (HCC-623), loco medio albo, et gula parva viridi; staminibus styloque segmentis tepalorum brevioribus; staminibus stylo brevioribus,

in ordinibus longitudinis duobus dispositis, stigmate profunde trifido, lobis valde recurvatis.

Holotype: No. 974 (TRA), taken Nov. 23, 1963, by Mrs. Clint. Brownsville, Texas; from bulbs obtained from Mexico.

Hymenocallis morrisonii (Vargas) Traub, **comb. nov.**

Syn.—*Stenomesson morrisonii* Vargas, in Nat. Hort. Mag., p. 132, pl. 3, Oct. 1943; *Pseudostenomesson morrisonii* (Vargas) Velarde, Rev. Cienc. li: 51. 1949.

Hymenocallis vargasii (Velarde) Traub, **comb. nov.**

Syn.—*Pseudostenomesson vargasii* Velarde, Rev. Cienc. li: 48. 1949.

Urceolina robledoana (Vargas) Traub, **comb. nov.**

Syn.—*Pseudourceolina robledoana Vargas*, in Bol. Fac. Sc. Univ. Cuzco 1: 7—8. 1960.

Pseudostenomesson (Velarde) Traub, **subg. nov.** (genus Hymenocallis L.; Amaryllidac).

Traub, Genera of Amaryllidac. 1963, p. 76. syn.—Genus *Pseudostenomesson* Velarde, Rev. Cienc. li: 47. 1949.

Elisena (Herb.) Traub, **subg. nov.** (genus Hymenocallis Salisb., Amaryllidac).

Traub, Genera of Amaryllidac. 1963, p. 76. syn.—Genus *Elisena* Herb. Amaryll. 201. 1837.

Ismene (Salisb.) Bak. ex Traub, **subg. nov.** (genus Hemenocallis Salisb., Amaryllidac.)

Traub, Genera of Amaryllidac. 1963, p. 76. syn.—*Ismene* Salisb., Trans. Hort. Soc. i: 342. 1812; Bak., Amaryll. 121. 1888.

Crinum amabile Don; var. cuperfolium (Traub) Traub, **comb. nov.**

Syn.—*Crinum asiaticum* var. *cuprefolium* Traub, in Plant Life 16: 93—94. 1960.

Crinum luteolum H. P. Traub et L. S. Hannibal, **sp. nov.**

A Crinum flaccido praecipue differt verni florens (sic in conjugio solivagum) et floribus parvioribus luteolis possidens.

HOLOTYPE: No. 985 (TRA), La Jolla, Calif., from bulb collected at Pichi-Richi Pass, Flinders Range, near Port Augusta, South Australia.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., Registrar,
Mr. Edward Authement, and Mrs. Emma D. Menninger,
Assistant Registrars

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1961) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. CATALOG OF HYBRID NERINE CLONES, 1882-1958, by Emma D. Menninger; and CATALOG OF BRUNSVIGIA CULTIVARS, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of THE GENUS X CRINODONNA was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition of "CATALOG OF HYBRID AMARYLLIS CULTIVARS, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis*, *Lycoris*, *Brunsvigia*, *Clivia*, *Crinum*, *Hymenocallis*, and so on should be addressed to Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

AMARYLLIS CLONES

EDWARD AUTHEMENT, *Assistant Registrar*

NEW AMARYLLIS BREEDERS, 1964

Abbrev.

Cuch.—Mr. Santo N. Cuchinotto, 2338 Independence St., New Orleans 17, La.

Fesm.—Mr. V. Roger Fesmire, 1170 So. Xavier St., Denver, Colo.

Lander.—Mr. C. W. Lander, 26 Cleveland Av., Milton Park, Salisbury, Rhodesia.

Moody—Mrs. James E. Moody, Box 35, Barney, Georgia.

Prudh.—Mr. Edward C. Prudhomme, 221 Rosa Av., Metairie, La.

Virg.—Mr. Milo C. Virgin, Columbia Road, Covington, La.

AMARYLLIS CLONES REGISTERED IN 1964

Registered by M. Van Waveren & Sons, N. V., Hillegom, Holland:

'Alfred Nobel' (VW. 1964), R; A-784, D-5A; U-4fld; 16″h; fls. 8″ diam; neyron rose (HCC-623) with green to white throat, whitish midribs; spr.

'Annie Hermes' (VW. 1964), R; A-785, D-5A; U-4fld; 18″h; fls. 8″ diam; rose madder (HCC-23); spr.

'Christine Spierenburg' (VW. 1964), R; A-787, D-4B; U-4fld; 24″h; fls. 9″ diam; rose bengal (HCC-25); spr.

'Deanne Durbin' (VW. 1964), R; A-788, D-5A; U-4fld; 22″h; fls. 7½″ diam; turkey red (HCC-721); spr.

'Dr. Ir. Louwes' (VW. 1964), R; A-789, D-5A; U-4fld; 12″h; fls. 7″ diam; indian lake red (HCC-826); spr.

'Elisabeth Andersen' (VW. 1964), R; A-790, D-5A; U-4fld; 22″h; fls. 8″ diam; rose red (HCC-724/3); spr.

'Garry Cooper' (VW. 1964), R; A-791; D-5A; U-4fld; 12″h; fls. 6″ diam; blood red (HCC-820); spr.

'Godesberg' (VW. 1964), R; A-792, D-5A; U-3fld; 19″h; fls. 7″ diam; geranium lake (HCC*-20); spr.

'Maria Callas' (VW. 1964), R; A-793, D-5A; U-4fld; 22″h; fls. 8″ diam; french rose (HCC-520), 3 upper segs whitish midribs with reddish stripes halfway up segs; spr.

'Maria Zamora' (VW. 1964), R; A-794, D-5A; U-4fld; 16″h; fls. 8″ diam; geranium lake (HCC-20); spr.

'Prof. Keesoom' (VW. 1964), R; A-796, D-15A; U-3fld; 15″h; fls. 8″ diam; claret rose (HCC-o21) with purplish cast; spr.

'Recherche' (VW. 1964), R; A-797, D-8; U-4fld; 12″h; fls. 4½″ diam; signal red (HCC-719); spr.

'Red Prince' (VW. 1964), R; A-798, D-5A; U-4fld; 21″h; fls. 8″ diam; blood red (HCC-820); spr.

'Red Trophy' (VW. 1964), R; A-799, D-5A; U-3fld; 14″h; fls. 6″ diam; signal red (HCC-719); spr.

'Scarlet Perfection' (VW. 1964), R; A-801, D-5A; U-4-5fld; 14″h; fls. 7″ diam; blood red (HCC-820) with faint white midrib; spr.

Description of 3 Van Waveren clones registered 1963:

'Joy' (VW. 1963), R; A-770, D-5A; U-4fld; 14″h; fls. 8″ diam; scarlet (HCC-19-19/1) with white midribs halfway up segs; spr.

'Leo Gestel' (VW. 1963), R; A-771, D-4A; U-4-6fld; 16″h; fls. 7″ diam; neyron rose (HHC-623); spr.

'Red Shank' (VW. 1963), R; A-772, D-5A; U-4fld; 14″h; fls. 6½″ diam; turkey red (HCC-721) with glossy turkey red throat; spr.

Registered by Milo C. Virgin, Columbia Rd., Covington, La.:

'Zeus' (Vir. 1964), R; A-802, D-5A; U-4fld; 24″h; fls. 8″ diam; scarlet (HCC-19); spr.

Registered by W. J. Perrin, 4753 Press Drive, New Orleans, La.:

'Grand Red' (Perr. 1964), R; A-803, D-5A; U-3-4fld; 16-18″h; fls. 7″ diam; cardinal red (HCC-822), with glossy cardinal red throat; spr.

Registered by Santo N. Cuchinotto, 2338 Independence St., New Orleans, La.:

'Orleans Beauty' (Cuch. 1964), R; A-804, D-5B; U-4fld; 18″h; fls. 6″ diam; white base with tyrian rose (HCC-24) stripes each side of white midrib to end of segs; spr.

Registered by Edward C. Prudhomme, 221 Rosa Ave., Metairie, La.:

'Delphi' (Prud. 1964), R; A-805, D-4B; U-4fld; 16″h; fls. 6½″ diam; fushine pink (HCC-627), greenish midribs ¾ length of segs, heavily veined; semi-ev, spr, fr.

'Dotty' (Prud. 1964), R; A-806, D-5B; U-4fld; 18″h; fls. 8″ diam; dutch vermilion (HCC-717.1), cherry red spots in throat; spr.

'Mardi-Gras' (Prud. 1964), R; A-807, D-8; U-2fld; 12″h; fls. 4½ to 5″ diam; orient red and blood red, minute red spots intermingled with white, blotchy appearance; semi-ev, spr.

'Neopolitan' (Prud. 1964), R; A-808, D-5A; U-4fld; 14″h; fls. 7″ diam; jasper red (HCC-o18) on white base each side of white midrib almost to edge of segs in upper 3 segs and upper half of 2 lower segs, pale green throat; semi-ev, spr.

'Crown' (Prud. 1964), R; A-809, D-5A; U-4fld; 18″h; fls. 7″ diam; jasper red (HCC-o18) with white edge around all segs; semi-ev, spr.

'Twist' (Prud. 1964), R; A-810, D-9; U-4fld; 18″h; fls. 5″ diam; cardinal red (HCC-822), very light whitish markings in throat; semi-ev, spr.

Registered by Mrs. Mildred P. Moody, Box 35, Barney, Georgia:

'Lou Anne' (Moody-1964), R; A-811, D-5A; U-6fld; 24″h; fls 8″ diam; upper 3 segs red veins on white, upper half of 2 lower setsegs veined red, lower petseg pure white; de, fr, spr.

'Zenora' (Moody-1964), R; A-812, D-5A; U-6fld; 24″h; fls. 8″ diam; bright red, velvet sheen, greenish white midrib shaded to deep red in throat; fr, de, spr.

Registered by Mrs. A. C. Pickard, 1702 N. Blvd., Houston 6, Texas:

'Fashion Show' (Pick. 1964), R; A-813, D-5A; U-4fld; 26″h; fls. 9½″ diam; carmine rose (HCC-21), shade lighter on lower segs; spr.

'Holiday' (Pick. 1964), R; A-814, D-5A; U-4fld; 24″h; fls. 9″ diam; currant red (HCC-822/2), darker throat; spr.

'Princess' (Pick. 1964), R; A-815, D-5A; U-4fld. 30″h; fls. 9″ diam; dawn pink (HCC-523); spr.

'Spring Beauty' (Pick 1964), R; A-816, D-5A; U-4fld; 28″h; fls. 9″ diam; porcelain rose (HCC-620); spr.

Registered by Ludwig & Co., Hillegom, Holland:

'Early White' (Lud. 1964), re-introduction, R; A-105, D-5A; U-4fld; 24″h; fls. 8-9″ diam; pure white, greenish-white throat; de, win or spr.

'Fiesta' (Lud. 1964), R; A-817, D-5A; U-4fld; 26-28″h; fls. 7-8″ diam; oriental red (HCC-819), darker veined towards the throat; win or spr.

'Mandarino' (Lud. 1964), R; A-818, D-5A; U-4fld; 26-28″h; fls. 8-9″ diam; intense capsicum red (HCC-715), blood red in throat; semi-ev, win or spr.

AMARYLLIS CLONES REGISTERED IN 1964

Registered by M. Van Waveren & Sons, N. V., Hillegom, Holland:

'Alfred Nobel' (VW. 1964), R; A-784, D-5A; U-4fld; 16″h; fls. 8″ diam; neyron rose (HCC-623) with green to white throat, whitish midribs; spr.

'Annie Hermes' (VW. 1964), R; A-785, D-5A; U-4fld; 18″h; fls. 8″ diam; rose madder (HCC-23); spr.

'Christine Spierenburg' (VW. 1964), R; A-787, D-4B; U-4fld; 24″h; fls. 9″ diam; rose bengal (HCC-25); spr.

'Deanne Durbin' (VW. 1964), R; A-788, D-5A; U-4fld; 22″h; fls. 7½″ diam; turkey red (HCC-721); spr.

'Dr. Ir. Louwes' (VW. 1964), R; A-789, D-5A; U-4fld; 12″h; fls. 7″ diam; indian lake red (HCC-826); spr.

'Elisabeth Andersen' (VW. 1964), R; A-790, D-5A; U-4fld; 22″h; fls. 8″ diam; rose red (HCC-724/3); spr.

'Garry Cooper' (VW. 1964), R; A-791; D-5A; U-4fld; 12″h; fls. 6″ diam; blood red (HCC-820); spr.

'Godesberg' (VW. 1964), R; A-792, D-5A; U-3fld; 19″h; fls. 7″ diam; geranium lake (HCC*-20); spr.

'Maria Callas' (VW. 1964), R; A-793, D-5A; U-4fld; 22″h; fls. 8″ diam; french rose (HCC-520), 3 upper segs whitish midribs with reddish stripes halfway up segs; spr.

'Maria Zamora' (VW. 1964), R; A-794, D-5A; U-4fld; 16″h; fls. 8″ diam; geranium lake (HCC-20); spr.

'Prof. Keesoom' (VW. 1964), R; A-796, D-15A; U-3fld; 15″h; fls. 8″ diam; claret rose (HCC-021) with purplish cast; spr.

'Recherche' (VW. 1964), R; A-797, D-8; U-4fld; 12″h; fls. 4½″ diam; signal red (HCC-719); spr.

'Red Prince' (VW. 1964), R; A-798, D-5A; U-4fld; 21″h; fls. 8″ diam; blood red (HCC-820); spr.

'Red Trophy' (VW. 1964), R; A-799, D-5A; U-3fld; 14″h; fls. 6″ diam; signal red (HCC-719); spr.

'Scarlet Perfection' (VW. 1964), R; A-801, D-5A; U-4-5fld; 14″h; fls. 7″ diam; blood red (HCC-820) with faint white midrib; spr.

Description of 3 Van Waveren clones registered 1963:

'Joy' (VW. 1963), R; A-770, D-5A; U-4fld; 14″h; fls. 8″ diam; scarlet (HCC-19-19/1) with white midribs halfway up segs; spr.

'Leo Gestel' (VW. 1963), R; A-771, D-4A; U-4-6fld; 16″h; fls. 7″ diam; neyron rose (HHC-623); spr.

'Red Shank' (VW. 1963), R; A-772, D-5A; U-4fld; 14″h; fls. 6½″ diam; turkey red (HCC-721) with glossy turkey red throat; spr.

Registered by Milo C. Virgin, Columbia Rd., Covington, La.:

'Zeus' (Vir. 1964), R; A-802, D-5A; U-4fld; 24″h; fls. 8″ diam; scarlet (HCC-19); spr.

Registered by W. J. Perrin, 4753 Press Drive, New Orleans, La.:

'Grand Red' (Perr. 1964), R; A-803, D-5A; U-3-4fld; 16-18″h; fls. 7″ diam; cardinal red (HCC-822), with glossy cardinal red throat; spr.

Registered by Santo N. Cuchinotto, 2338 Independence St., New Orleans, La.:

'Orleans Beauty' (Cuch. 1964), R; A-804, D-5B; U-4fld; 18"h; fls. 6" diam; white base with tyrian rose (HCC-24) stripes each side of white midrib to end of segs; spr.

Registered by Edward C. Prudhomme, 221 Rosa Ave., Metairie, La.:

'Delphi' (Prud. 1964), R; A-805, D-4B; U-4fld; 16"h; fls. 6½" diam; fushine pink (HCC-627), greenish midribs ¾ length of segs, heavily veined; semi-ev, spr, fr.

'Dotty' (Prud. 1964), R; A-806, D-5B; U-4fld; 18"h; fls. 8" diam; dutch vermilion (HCC-717/1), cherry red spots in throat; spr.

'Mardi-Gras' (Prud. 1964), R; A-807, D-8; U-2fld; 12"h; fls. 4½ to 5" diam; orient red and blood red, minute red spots intermingled with white, blotchy appearance; semi-ev, spr.

'Neopolitan' (Prud. 1964), R; A-808, D-5A; U-4fld; 14"h; fls. 7" diam; jasper red (HCC-o18) on white base each side of white midrib almost to edge of segs in upper 3 segs and upper half of 2 lower segs, pale green throat; semi-ev, spr.

'Crown' (Prud. 1964), R; A-809, D-5A; U-4fld; 18"h; fls. 7" diam; jasper red (HCC-o18) with white edge around all segs; semi-ev, spr.

'Twist' (Prud. 1964), R; A-810, D-9; U-4fld; 18"h; fls. 5" diam; cardinal red (HCC-822), very light whitish markings in throat; semi-ev, spr.

Registered by Mrs. Mildred P. Moody, Box 35, Barney, Georgia:

'Lou Anne' (Moody-1964), R; A-811, D-5A; U-6fld; 24"h; fls 8" diam; upper 3 segs red veins on white, upper half of 2 lower setsegs veined red, lower petseg pure white; de, fr, spr.

'Zenora' (Moody-1964), R; A-812, D-5A; U-6fld; 24"h; fls. 8" diam; bright red, velvet sheen, greenish white midrib shaded to deep red in throat; fr, de, spr.

Registered by Mrs. A. C. Pickard, 1702 N. Blvd., Houston 6, Texas:

'Fashion Show' (Pick. 1964), R; A-813, D-5A; U-4fld; 26"h; fls. 9½" diam; carmine rose (HCC-21), shade lighter on lower segs; spr.

'Holiday' (Pick. 1964), R; A-814, D-5A; U-4fld; 24"h; fls. 9" diam; currant red (HCC-822/2), darker throat; spr.

'Princess' (Pick. 1964), R; A-815, D-5A; U-4fld. 30"h; fls. 9" diam; dawn pink (HCC-523); spr.

'Spring Beauty' (Pick 1964), R; A-816, D-5A; U-4fld; 28"h; fls. 9" diam; porcelain rose (HCC-620); spr.

Registered by Ludwig & Co., Hillegom, Holland:

'Early White' (Lud. 1964), re-introduction, R; A-105, D-5A; U-4fld; 24"h; fls. 8-9" diam; pure white, greenish-white throat; de, win or spr.

'Fiesta' (Lud. 1964), R; A-817, D-5A; U-4fld; 26-28"h; fls. 7-8" diam; oriental red (HCC-819), darker veined towards the throat; win or spr.

'Mandarino' (Lud. 1964), R; A-818, D-5A; U-4fld; 26-28"h; fls. 8-9" diam; intense capsicum red (HCC-715), blood red in throat; semi-ev, win or spr.

'Red Coral' (Lud. 1964), R; A-819, D-5A; U-4fld; 27-29″h; fls. 8-9″ diam; blood red (HCC-820) with darker, glossy throat; de, win or spr.

'Petticoat' (Lud. 1964), R; A-820; U-4fld; 26-28″h; fls. 6-7″ diam; pure white, red edged—ideal picotee; ev, win or spr.

'Constant Comment' (Lud. 1964), R; A-821, D-8; U-4-5fld; 22-24″h; fls. 4-5″ diam; dark winered Gracilis; ev, win or spr.

'Melody Lane' (Lud. 1964), R; A-822, D-8; U-4-5fld; 16-18″h; fls. 4-5″ diam; salmon orange, lighter color in throat; ev, win or spr.

AMARYLLIS REGISTRATION—continued on page 51.

CORRIGENDA

PLANT LIFE, VOL. 20. 1964—
CATALOG OF HYBRID AMARYLLIS CULTIVARS, 1799 TO DEC. 31, 1963

Page 13, 1st. line, for 'Ambiguum' read 'Ambigua'.
Page 13, line 17, for 'A-555' read 'A-565'.
Page 14, line 29, delete 'NR'.
Page 14, line 32, delete '(VM. 1963)'. End with 'for a Dutch breeder'.
Page 16, line 31, read 'Cavalier' R; A-774, D-5A; U-3-4fld; 12″h; fls. 7″ diam; scarlet (HCC-19); spr.; I.—Goed. 1962 for a Dutch breeder.
Page 21, line 5 from bottom, for 'Floral Queen' read 'Flora Queen'
Page 22, line 21, read 'R; A-143'.
Page 25, line 2 from bottom, read 'Joy' (VW. 1963), R; A-770, D-5A; U-4fld; 14″h; fls. 8″ diam; scarlet (HCC-19) with white midribs halfway up segs.
Page 27, line 11, read 'Leo Gestel' (VW. 1963), R; A-771, D-4A; U-4fld; 16″h; fls. 7″ diam; neyron rose (HCC-623).
Page 34, line 14, for 'A-163' read 'A-613'.
Page 35, Line 17, read 'Red Shank' (VW. 1963), R; A-772, D-5A; U-4fld; 14″h; fls. 6½″ diam; turkey red (HCC-721) with glossy turkey red throat.

NERINE CLONES

The following are additions (not registered) to the "Catalog of Nerine Cultivars."

'Mary Fenwick', a *N. bowdenii gigantea* variant; differs in number of chromosomes, relatively larger flowers. See Gard. Chron. March 23, 1963, p. 205. See 'Fenwick' Plant Life 19: 68. 1963.

'Mary Knight', a *N. bowdenii gigantea* variant, very pale pink. See Gard. Chron. March 23, 1963, p. 205.

'Mary Sealy', a *N. bowdenii gigantea* variant, darker pink. See Gard. Chron. March 23, 1963, p. 205.

'Quinton Wells', a *N. bowdenii gigantea* variant, with smaller flowers, segs markedly waved, first to flower. See Gard. Chron. March 23, 1963, p. 205.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Milula spicata Prain, Ann. Roy. Bot. Garden, Calcutta 5(2): 165, plate 200. 1895-(1896).—Herbs; bulb elongate, the lower half covered with fibrous scales which are the remains of old leaves; roots numerous; leaves linear-lanceolate, equaling or surpassing the fistulose scape which, in turn, is twice as long as the bulb; spike cylindric, included by a basal, spathaceous, ovate-acuminate bract; flowers becoming green-reddish, small, very many, campanulate, the perianth-segments equal, their margins undulate-fimbriate; stamens in two series, the exterior three alternate with the carpels and with the lower half of the filaments expanded and petaloid, the lower 3 opposite the carpels, slightly shorter, filiform upwards; anthers versatile, all perfect; ovary subglobose; ovules attached at the inner angle of the cell somewhat above the base; capsule globose, with always one ovule (seed) in each cell, sometimes both (two?) aborted; seeds black. In the eastern Himalayas, at Chumbi, collected by Do-tho, King's hired collector.

Phaedranassa megistophylla Kraenzl., Engl. Bot. Jahrb. 54 (Beiblatt #117); 2—3. 1916.—Bulbs subglobose, somewhat depressed, 8—9 cm. in diameter, copiously covered with brown tunics, 1- or 2-leaved; leaves subsessile or shortly and broadly petiolate, very broadly oblong, obtuse, (Pale?)—margined, rather thick, fleshy, canaliculate, the largest seen by me 37 cm. long (including the short petiole), about 11—12 cm. wide, usually more or less shorter and broader; scape without inflorescence 75—105 cm. tall, thick, terete, glaucous as are also the leaves and flowers, pruinous; spathe of the inflorescence quickly perishing in linear fragments; flowers more than 20, successive; pedicels during the anthesis of the flowers 6—8 cm. long, those of the buds much shorter, the entire inflorescence resembling that of Brunsvigia; ovary during anthesis oblong, later triquetrous, inerassate; leaves of the perigonium merely connate, later noticeably dilated and divergent, forming and narrow scarcely open little funnel, all equally long, 4 cm. long, to 7 mm. wide toward the apex, glacous, pruinous on the outer surface; stamens fertile during anthesis, equaling the perigonium, the anthers soon becoming effete and deciduous; filaments slightly compressed; style considerably surpassing the perigonium, to 6 cm. long; stigma slightly declinate, somewhat 3-parted.

Urceolina microcrater Kraenzl., Engl. Bot. Jahrb. 54. (Beiblatt #117): 3—4. 1916.—bulbs globose, about 4 cm. in diameter, with numerous roots, narrowed into a short neck 2 cm. in length; leaves absent during anthesis; scape slender, fine, 45 cm. tall to the inflorescence; spathe divided into 2 or 3 linear segments 3—4 cm. long; flowers 5, arranged in a raceme; pedicles during anthesis variable in length, 2—8 cm. long, slender; ovary ovoid, deeply 3-sulcate, 5 mm. long and thick;

tube of the perigonium narrowed from the slightly wider base, to 6 mm. long, green, abruptly dilated, campanulate, not truly urceolate above, the lobes 6, equal, lanceolate, free almost to the base, 2 cm. long, 6 mm. wide, yellow later green, white-margined toward the apex, the entire flower at anthesis 3.5 cm. long and 2 cm. in diameter; stamens about equaling or somewhat surpassing the perigonium; style linear, somewhat longer; stigma clavate, incrassate, manifestly papillose.

Brunsvigia rautanenii Bak., Bull. Herb. Boiss. Ser. II. Vol. 3, p. 667. 1902.—Bulb unknown; leaves unknown; peduncle 2.5—3.2 cm. in diameter at the apex; umbel 20—30-flowered; pedicels strict, ascending, 22.9—25.4 cm. long, strongly angled at the apex; perianth red, the tube cylindric, 1.3 cm. long, the segments of the limb unguiculate, 1.7—1.9 cm. long; filaments red, longer than the limb; ovary obconic, acutely trigonous, 1.1—1.3 cm. in diameter. Conspicuously different from all the other known species.

AMARYLLIS CYBISTER FLOWERED IN CALIFORNIA

W. Quinn Buck,
Los Angeles State & County Arboretum,
Arcadia, California

In March of 1963 a bulb of *Amaryllis cybister* came as a gift from Prof. Ira S. Nelson of the University of Southwestern Louisiana at Lafayette, La. A flower spike had started to emerge from the small bulb, which was well established in a four-inch pot.

The spike developed slowly as we waited impatiently to see the flowers. When finally the buds did open we had a happy surprise in that the color was not what we had expected from the descriptions of this orchid-flowered *Amaryllis* from Bolivia and Brazil. The five flowers opened all together and formed an elegantly compact group, each flower having creamy green segments with a crimson base that gave the flower a scintillating red throat. Everyone who got to see this species was delighted with it.

After making good growth for a year, the bulb bloomed in 1964 with an even finer spike, which was larger and taller than in 1963 but still smaller than the type described. Again some flowers were selfed, and part were pollenated with pollen from hybrids and other species. No pods formed on either spike. When crossed on *Amaryllis striata fulgida* by Mrs. Bert Williams, she was able to get pods to set, and she and her friends are looking forward to the flowering of these vigorous seedlings.

This thoroughly charming species should be more widely grown as it can become available. The green form suggests interesting breeding possibilities. See Cover Design of the present issue, and Fig. 23, for unique form of this species.

Fig. 23. Drawings of *Amaryllis cybister* made by Prof. Penrith Goff as an alternate cover design.

Fig. 24. Hybrid *Lycoris* (*L. haywardii* × *L.* "Sperryi"), as grown near Nashville, Tenn., Aug. 18, 1964. Color white with faint pinkish lines along outside of segs. Photo by Sam Caldwell.

3. GENETICS AND BREEDING

1964 LYCORIS REPORT

SAM CALDWELL, *Nashville, Tennessee 37211*

The year 1964 was the best ever for lycorises in my plantings. Everything bloomed that reasonably could have been expected to flower, and most exciting was the opening of four new hybrids.

In my area (middle Tennessee) the winter preceding a lycoris season strongly affects the amount of bloom we get. Following a mild winter, bloom is usually good; a very cold one damages foliage on a number of species and thus inhibits flower production.

For buyers of fuel to heat homes, our 1963-'64 winter brought record cold but for plants it was relatively mild. The seeming contradiction is explained by the fact that there were many more days than usual of temperatures in the teens and twenties, requiring the consumption of much fuel, but there were never any extremely bitter spells. Five above zero was the lowest temperature experienced—far from the 13- and 15-below-zero marks of the previous winter, which had completely stopped bloom on most of my lycorises that make foliage in fall. Apparently those species maintaining live green leaves over the winter can tolerate extended periods of Freezing weather but begin to suffer when temperatures drop near zero.

THE SPECIES, IN ORDER OF BLOOM

First to appear was a scape of the orange colored *L. kiushiana*, on July 10.

July 13 brought a scape of the hardy yellow *L. chinensis* into prime condition. Most notable observation is that since my one bulb, planted in 1958, started blooming in 1961, it has bloomed regularly for four years straight. There seems to be little increase, though judging from foliage of the past spring, there are now two bulbs.

All through the second half of July there were blooms of *L. sanguinea* in numerous locations. Its orange color is much better in shade than in the sunny places but somehow does not appeal to me.

One small scape of *L.* "cinnabarina" was open on July 20. It will take further observation but I still think this may turn out to be really *L. kiushiana*.

From July 20 to 30 there were excellent blooms of *L. haywardii*. It thrives in the shady spots and the blooms look best and last longest there.

Also from July 20 through two or three weeks of generous flower production we enjoyed *L. squamigera* in all locations where I have established bulbs.

Reaching peak on July 26 and lasting another week were two good scapes on the large hardy yellow lycoris which we call *L.* "sperryi." Actually, I have about eight large bulbs of this now, so the percentage

of bloom was not good. Miss Aileen Bishop, who has the original clumps of this species here in Nashville, had nine scapes. It is similar to *L. chinensis* but has taller scapes and comes consistently about two weeks later than *chinensis*.

During the first half of August there were three wonderful scapes of white *L. houdyshelii* on a clump shaded by a dogwood tree. I have bulbs in two other locations that did not flower.

L. incarnata was late starting this year but by mid-August was showing dozens of scapes.

Also the middle of August brought the first of *L. sprengeri*, with additional blooms coming to stretch the season for more than two weeks.

Through the same period there developed exactly 15 very fine scapes on *L. caldwellii*. Definitely the best display I've seen on this species was due, apparently, to the cool, cloudy and wet weather occurring at the time. All my bulbs of this are in shady locations now. Flowers were unusually large, on two- to three-foot scapes, and the pale yellow color held up well without the usual fast bleaching.

All of the latter half of August the fertile *radiatas* bloomed in quantity. The strain sent me by B. Y. Morrison always starts a little later than the other fertile form I have. My common *radiatas* (the triploid, sterile form), which normally flower around mid-September, gave very scant bloom this year. They are never as floriferous here as the fertile ones; in the severe 1962-'63 winter they appeared to be hurt more than any others, and their bulbs may not be fully recovered as yet.

Beginning around the end of August and lasting through most of September were dozens and dozens of scapes on *L. elsiae* and the various other delicately pastel tinted spiderlily forms which dealers sell as "Albiflora," "Albiflora carnea," "White" lycoris and the like (all grown here in coldframes, covered in winter). This "near white" group was covered in my report of last year, so I'll not repeat details given there. Ample rainfall and unseasonably cool nights that we experience through their blooming this year enhanced the richness of their usually pale coloring. Yellow, pink and salmon tints in various blooms were strong and beautiful.

Because many factors cause color variation in these flowers—age of bloom, light, temperature, soil and moisture—one runs into difficulty when attempting to segregate bulbs that are producing identical blooms. There is a "family resemblance" in all of them but certainly there are numerous variants—some meriting separate propagation. Strangely, in spite of the "albiflora" (white-flowered) name, I have never seen a pure white individual among them. Has anyone? I mean white all the way, of course—not just fading white from original cream, yellow, salmon or pinkish tints.

The variation among these flowers tends to support the Japanese theory that *L. albiflora* is a natural hybrid between *L. aurea* and *L. radiata radiata;* at least, in my own crosses of the fertile *radiata* with *L. sprengeri* there is variation among seedlings quite like that occurring in the "albiflora" group.

Fig. 25. Hybrid *Lycoris* (*L. haywardii* x *L. sanguinea*), as grown near Nashville, Tenn., Aug. 4, 1964. Color orange pink, bluish tints at the tips of the segs with age. Photo by Sam Caldwell.

HYBRIDS

Beginning August 7 and running through August 25 there were 48 scapes on various lots of the *sprengeri-radiata* hybrids that I started in 1954 and '55 and that began to bloom first in 1961. Dr. Traub has named these *L.* x *jacksoniana*, replacing the convenience label, "Sprenrad Hybrids," formerly used. Variations in the numerous flowering scapes brought daily thrills. I marked a few that seemed outstanding; I rather prefer those with widest segments and the deep rose and purple-red shades. However, some of the lighter ones, mainly pink but with blue-tipped segments, are beautiful.

When three scapes began to push up on *L. haywardii* X *L. sanguinea* seedlings in July I was excited, not only because this was to be their first bloom but also because the seedlings were just five years old. I had never previously had a lycoris seedling to bloom in less than six years. Eventually two more scapes came up on another lot of the same cross (these were six years old), and two weeks later there were two scapes on a group of reciprocal cross (*L. sanguinea* X *L. haywardii*) seedlings. These hybrids turned out to be highly predictable in appearance; their parents are similar in flower form and so the "children" are the same, with plain, smooth-edged segments. (See Fig 25.) The color is a salmon or orange-pink shade with a suggestion of *L. haywardii's* blue segment tips showing as the flowers age. Scapes averaged about 15 inches tall, with three to five flowers per umbel and the umbels measured some seven inches across. The variation so evident in *sprengeri-radiata* hybrids is not present in this cross—flowers on all of the seven scapes were practically identical. Those with *L. sanguinea* as seed parent did come two weeks later than the others and had flowers just a little larger and with slightly wider segments. These are points to be checked in future years, because they could be due to differences in growing conditions.

These "Haysan Hybrids" (temporarily, for convenience) are interesting and probably worth having but to my way of thinking will not create much of a stir in the lycoris world.

Back in 1958 when I first saw the golden *L.* "sperryi" flowers here in Miss Bishop's garden, I brought home pollen and used it on a bloom of my *L. haywardii*. Six large seeds resulted and eventually two bulbs. When I saw a big bud pushing out of the ground in August from one of these I began mentally to visualize what might result from a blending of lavender-pinkish *L. haywardii*, with its severely plain form, and the golden-orange frilliness of spiderlily flowers on *L.* "sperryi."

A sturdy 23-inch scape grew up with six light greenish buds marked with pink longitudinal lines. They opened on August 18, slightly greenish-yellow for a few hours but then becoming white. (See Fig. 24). For all practical purposes it is a large (more than 10 inches across) loose umbel of white flowers with crinkled and reflexed segments in typical spiderlily pattern. Very faint pink lines remain along the midribs of segments on the outside and greenish-yellow lines radiate from flower centers within, but the overall effect is white. While individual flowers

are pretty and "different," they are held on relatively long pedicels—up to 2⅝ inches—and the umbel is less attractive to me than a more compact type. I have a few more bulbs of this to flower (from repetitions of the cross in 1959) and expect to see considerable variation in the seedlings. Actually, something good should come of this.

Of special interest in my lycoris "nursery" frame was the fact that two scapes of the previously mentioned "Haysan Hybrids" were still in good condition and were just about a foot away from the big white "Haysper" bloom. It was hard to realize that both had the same seed parent (see accompanying photographs).

Fig. 26. *Lycoris* x *washingtonia* (*L. radiata* x *L. chinensis*), originated by Dr. John Creech. Flowered near Nashville, Tenn., Aug. 20, 1964. Color soft buttery yellow self.

The next hybrid I saw was not of my own but was the *L. radiata*—*L. chinensis* cross made in Washington, D. C. in 1950 by Dr. John L. Creech. Dr. Traub sent me a bulb of this in July, 1962, and it bloomed August 20 this year. It is an altogether delightful modest-sized spider-lily type yellow lycoris. See Fig. 26.) Some years ago I received a report that flowers of this cross were "yellow with longitudinal reddish

stripes," but mine turned out to be a soft buttery yellow self—no red markings at all. Probably different seedlings vary, though Dr. Traub reports no marked difference in several he has made to bloom. Mine had a 15-inch scape with five flowers in a beautifully compact but not crowded umbel about 6 inches across. Segments are a little broader than in *L. radiata;* otherwise it reminds one of a yellow *radiata.* I believe it will be extremely popular when stocks can be increased.

Closing the season for me in late September were two nice scapes on *L.* x *lajolla.* Dr. Traub sent me seeds when he made this cross of *L. aurea* and *L. traubii* back in 1957. Thus these seedlings bloomed in seven years, under pot culture all the way, as both parents are too tender for outdoor planting here. I had lifted and repotted these bulbs in August, just a couple of weeks before the scapes started, so doubt that these first blooms, from the recently disturbed bulbs were typical size. Nevertheless, this seems to be a relatively large-flowered lycoris of rich golden color. Flowers in the umbels (nine had five each) have a pleasing upward tilt and broad segments. A tentative judgment is that besides being a very beautiful lycoris it is going to be one well adapted for container culture. The potted bulbs have grown clean, healthy and strong from the beginning.

LOOSE END

My lycoris report last year told of a "New Import—Hardy Golden Spiderlily," which had been marketed in this country in 1962. I have over 500 of these bulbs and distributed a number to friends for trial in different localities. Thus far I have had no bloom nor has any been reported to me, although the bulbs make foliage growth early each spring. I reported last year the resemblance of their foliage to the leaves of the rare *L. chinensis* and *L.* "sperryi"—hardy yellow species that I have. But with another year these "New Import" bulbs have grown larger and their leaves broader; to me they look exactly like *L. squamigera* foliage. I will not be greatly surprised if the "Hardy Golden Spiderlily" label proves to be a hoax and the bulbs really *are L. squamigera.*

Meanwhile, now in the fall of 1964 our local Woolworth stores are selling bulbs with once again the same color plate of a yellow lycoris and the same "New Import—Hardy Golden Spiderlily" label of two years ago. So I'm still hoping the label may be true.

STEPS TOWARD THE LARGE-FLOWERED YELLOW AMARYLLIS HYBRIDS

Hamilton P. Traub

In 1952, Dr. Castellanos sent seeds of the very light yellow-flowered *Amaryllis* species, *A. aglaiae.* When these seeds germinated and bulblets had been formed, these were widely distributed so that progress could be made toward the large-flowered yellow *Amaryllis* hybrids. Some of the results have been reported in past issues of the Amaryllis Year Book.

A few years ago, plants of *Amaryllis aglaiae,* maintained in plastic pots, bloomed for the writer, but it was not possible to set seeds on these either by selfing, or crossing of sibling seedlings, or by crossing with the large-flowered white hybrid *Amaryllis.* The plants made lush growth in pot culture and this may have had something to do with the lack of results.

In the spring of 1964, one of the plants set out in the open under ordinary garden conditions produced a scape, and this time seeds were obtained by selfing, and by crossing with a large-flowered white with yellowish throat. This latter cross is the first step toward a large-flowered yellow *Amaryllis.* Seeds were sent to Mr. Quinn Buck, and a few others, so that rapid progress can be made.

When the hybrid seedlings flower, an attempt will be made to intensify the yellow by selfing; back crossing on *A. aglaiae,* and also by crossing with the very light yellow form of *Amaryllis evansiae,* and the yellow form of *Amaryllis pardina,* if the last named can be obtained in the meantime. Possibly, the greenish-yellow form of *Amaryllis calyptrata* might also be useful in such a breeding project. It is hoped that others will report on their progress toward the large-flowered yellow *Amaryllis* hybrids in the future issues of the Amaryllis Year Book.

DAYLILIES IN 1964

W. Quinn Buck, *Chairman*
Daylily Committee, American Plant Life Society

During the 1964 daylily flowering season the most outstanding event for the writer was the opportunity to visit the garden of Dr. Hamilton P. Traub in La Jolla, California, for the first time in several years. This mid-June visit was an especial pleasure because of all the new things that Dr. Traub had to exhibit.

While waiting for the heavy morning overcast to clear away and permit the day's new flowers to open, we talked about the new work at length. This discussion was interrupted by Dr. Traub's bringing out incredibly beautiful and fresh flowers from the day before which had kept perfectly in the refrigerator. With the exception of a couple of fine diploids selected for release, all were tetraploid seedlings derived from a polyploidized form of 'Artemis' (Norton), which Dr. Traub had admired in its diploid form for its complete sunfastness and "butterfly" shape; both of these characteristics have been established in Dr. Traub's lines, so that now he has huge flowers with wonderful shape, substance, and sunfastness, in a wide range of yellows and golds. (See Fig. 27). One of the most outstanding was a light cream flower of medium size, and with superb substance and shape. There were also several reds of unbelievable color quality.

By late morning the high fog had cleared sufficiently to allow the morning's flowers to open quickly, and in the garden we again were impressed by the array of seedlings in bloom. All kinds of fine yellows were interspersed with reds of greatest depth and smoothness; there

Fig. 27. *Hemerocallis washingtonia*. Butterfly strain tetraploids raised by Hamilton P. Traub, La Jolla, Calif. (Left) light yellow; (right) golden yellow. Photo by Jack Romine, 1964.

was also one red with very good branching, and it is to be used with all the others. Dr. Traub's pride was a huge reddish lavender-purple, (See Fig. 28), from which he hopes to obtain a whole new line of purples and lavenders. The writer regrets not being able to give names or numbers for some of these fine seedlings.

Fig. 28. *Hemerocallis washingtonia.* Mulberry purple tetraploid raised by Hamilton P. Traub, La Jolla, Calif. Photo by Jack Romine, 1951.

In the Buck garden in Arcadia, California, the season was quite late because of the cool spring, but there were many interesting seedlings, such as several huge, bold tetraploid bicolors derived from 'Sue Booth' (Buck). There were some large bright reds with 'Tetra Painted Lady' in their ancestry, besides some handsome dark reds of rich quality. An unusual kind of mahogany red was exhibited by a group of seedlings derived from 'Tetra Redrock Canyon'; this group, unfor-

tunately, lacked sunfastness. In the Buck garden there was a really great range in the yellow-to-orange group in height, size, and shape. See Fig. 29 for the clone 'Arcadia Pink'.

Fig. 29. *Hemerocallis washingtonia*. Tetraploid 'Arcadia Pink', raised by W. Quinn Buck, Arcadia, Calif. Photo by Jack Romine, 1954.

The Fay-Griesbach tetraploids in Illinois can be reported on only from information given by visitors, as well as from the excellent slides of Robert Baker Wynne, and from information and slides furnished by Mr. Orville W. Fay himself. During 1964, Mr. Fay and Dr. Robert A. Griesbach flowered about 4,000 new tetraploid seedlings, including some 400 bright reds; all colors yet obtained in daylilies were represented, as well as several entirely new colors. Mr. Fay reports that the number of visitors this year was so great as to make it impossible

Fig. 30. *Hemerocallis washingtonia.* Fay tetraploids (left) Fay 62-51; (right) Fay T63-24.

for them to study and number the 1964 crop of seedlings, which will have to be held over for another year.

In 1963 Mr. Fay flowered around a thousand tetraploid seedlings, the majority involving 'Crestwood Ann'. The 1964 season afforded opportunities for further observation of the selected seedlings. T62-51 (see Fig. 30) is a particular favorite with Mr. Fay because of its shape, its color—nearly white—and its tremendous substance. This is an induced tetraploid of a cross of Frances Fay X 58-22. This same cross also gave T61-17, which Mr. Fay considers one of his best. Melon T63-24 (see Fig. 30) and T63-5, which is not a melon but a very light color, are among the best of the 1963 selections, because of fine flowers, excellent stems, and good plant characteristics.

Mrs. W. T. Hardy, in Alabama, flowered a number of fine tetraploid seedlings, some of the most beautiful coming from crosses of 'Mildred O'Neal' (Kraus). R. W. Munson, Jr., in Florida, reported flowering a few superior yellow tetraploids. Dr. Virginia Peck, in Tennessee, treated some 7,000 germinating seed in 1964, and she undoubtedly flowered additional fine induced seedlings. In 1963 Dr. Peck had a number of fine tetraploids of which we got to see slides.

Among the newer diploid daylilies the most outstanding in the writer's collection in 1964 were 'Louise Simon' (MacMillan), a huge melon of great quality; 'Sholom' (MacMillan), of particularly fine flat shape and light color, more yellow than melon, but very beautiful; 'Blue Jay' (Spalding), the best "blue" the writer has obtained anywhere; 'Prairie Beauty' (Marsh) and 'Prairie Champ' (Marsh), both large and good; 'Frankly Fabulous' (Childs), a gold-edged melon that can be most incredibly beautiful; 'Symphonette' (Childs), another wonderful melon with a golden glow throughout the color; 'Laurel Anne' (Fischer), very lovely in spite of its resentment of our cool nights; and 'Monica Ann' (Fay), which showed the most wonderful branching for a first-year plant.—*Los Angeles State & County Arboretum, Arcadia, California.*

HYBRID AMARYLLIS FOR DESERT REGIONS

Mrs. Frank McCown, *P. O. Box 176, Holtsville, California*

Summer is long and hot in this region of the Colorado Desert, near the border of the Mexican State of Baja California, starting in early June and remaining warm until late October. That a plant as seemingly fragile as the hybrid *Amaryllis* could thrive and bloom in this climate, with occasional highs of 115° and 118°F. during July and August, seems a miracle.

The hybrid *Amaryllis* clone 'Holtsville' was originally given as a gift to one resident in the town. She planted it in a favorable location on the east side of her home in sandy loam where it received morning sun and protection from the fierce noon sun of summer and strong west

winds of spring and frost of December and January. This one bulb rapidly multiplied and over the years found its way in many other gardens in Holtsville, in Imperial County.

My own interest was sparked when a friend asked me if I had seen the "Red Lily" blooming in a neighbor's yard. This was in August. The fact that anything that could answer the description of a red lily that was blooming in August made me investigate. And there, as my friend said, was a scape with two very thrifty red blossoms, an *Amaryllis*. Bulbs soon found their way in my garden and bloomed the following April (Fig. 31) along with the Dutch Hybrids and again an occasional spike would surprise me during the summer and fall months.

Fig. 31. Hybrid *Amaryllis*, clone 'Holtsville' as grown by Mrs. Frank McCown, Holtsville, Calif., is resistant to high temperature and drought. Photo by Mrs. McCown, 1964.

This vigorous *Amaryllis* Hybrid undoubtedly has quite a bit of *A. aulica* in its background. The flowers, usually two to a scape, are vivid red with a six pointed white star in the throat. Dark maroon shading accents the white star. The broad, rich green, strap shaped leaves sometime reach three and four feet in height and are evergreen. Offsets are rapidly produced.

In the spring of 1962 I made crosses between this clone and the half dozen Dutch Hybrids that grow very well under a Pecan Tree where they receive summer shade and good drainage. In April of 1964 one seedling although quite small bloomed. Very like its 'Holtville' parent in coloring and of only medium size, the only good quality noted was its ability to bloom so young. By the summer of 1965 I anticipate

bloom on a good many of the seedlings and in the following year any ability to make offsets and repeat bloom should begin to show up. These two characteristics if they could be combined with the beauty of the Dutch Hybrids, could point the way to a new type of hybrid that would do well in desert regions.

CYRTANTHUS PURPUREUS

Cyrtanthus purpureus (Ait.) Traub (syn.—*Vallota purpurea* (Ait.) Herb. = *V. speciosa* (L. f.) Dur. & Schinz) is an excellent horticultural subject but unfortunately has been much neglected.

Mr. Roy Hansberry, of Modesto, Calif. (Plant Life 18: 145. 1962) has reported on its culture under the title, "West Coast Vallota Culture". Since this was published, the genus *Vallota* Herb. has been united with the genus *Cyrtanthus* on biological grounds as indicated in Traub—"The Genera of Amaryllidaceae" (1963), page 66.

Since *Cyrtanthus purpureus* (under the synonym *Vallota*) is offered by a number of American dealers, and by Ludwig & Co., Hillegom, Holland, the members should obtain bulbs and report in the Year Book on their experiences with this delightful plant subject.—*Hamilton P. Traub.*

PLANT LIFE LIBRARY—continued from page 38.

PHILOSOPHY OF SCIENCE. THE DELAWARE SEMINAR. Bernard Baumrin. Editor. Interscience Publ., a division of John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. Vol. 1. 1963. Pp. 370. $9.75; Vol. 2. 1963. Pp. 551. $14.50.

The long range purpose of this series is to bridge the growing chasm between the two intellectual cultures of our time—the scientific and humanistic communities.

In Volume 1, the scope of the philosophy of science is presented by sixteen authorities: two basic distinctions: scientific explanation and prediction: philosophical aspects of foundation mathematics, biology, social science, and of physics. In volume 2, nineteen authorities discuss in detail current philosophical developments pertaining to the physical sciences. These volumes are highly recommended.

The volumes to follow on the biological, and social and behaviorial sciences; and the formal disciplines of logic and mathematics, will be eagerly awaited by scientists generally.

THE GEOGRAPHY OF THE FLOWERING PLANTS, by Ronald Good. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1964. Pp. 518. Illus. $13.00. This third revised edition of an outstanding text is necessitated by the rapid progress made in our understanding of the geographical distribution of flowering plants. After an introduction indicating the importance of plant geography, Part 1 is concerned mainly with the division of the world into floristic regions with special reference to the bioevolutionary background; the distribution of plant families, genera, and species. Part 2 is devoted to the factors involved in plant distribution —climatic, edaphic, and geographical changes; and to the theory of tolerance. The illustrations are outstanding. This volume is highly recommended.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

THE 1963-1964 AMARYLLIS SEASON

ROBERT D. GOEDERT,
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Another *Amaryllis* season has passed. Generally almost all amaryllis flowered late this season. The Dutch Growers experienced some difficulty in setting buds and as a result the bulbs arrived in the United States nearly a month late. Normally the hybrid amaryllis bulbs imported from Holland flower nearly 100% but this season there were more complaints than normal that bulbs did not flower at all. This always results in some indignation on the part of the customer and is one of the factors that plague the amaryllis dealer. There was a marked increase in late flowers this season and now, May 15, spikes are still appearing.

The hybrid amaryllis from South Africa are becoming more popular each season. Many fanciers like to have a few early flowers and the amaryllis from South Africa, being shipped from the southern hemisphere, arrives in early October and can be flowered during November the first season. The South African growers, like the Dutch, maintain a high standard of quality. Most bulbs can be expected to make two or more spikes. These amaryllis show more characteristics of the Warmenhoven Strain which they have used extensively in breeding. The Warmenhoven Strain is generally considered the largest flower strain of the Dutch growers. The Indian and Japanese growers on the other hand use the Ludwig Strain in their hybridizing.

The true Dutch strain hybrid amaryllis can be obtained from India. Almost all are seedlings of the Ludwig Strain. While the quality of the flowers is very good, the growers experience difficulty in obtaining bulb size and the percentage of flower spikes obtained from the Indian bulbs the first year is very low, often not over 20%. Most bulb dealers are discontinuing buying these bulbs for these reasons.

Amaryllis belladonna L. (syn. *A. equestris* Ait.) from India is nice small amaryllis and will naturalize well among pine trees in the south where winter temperatures do not fall much below freezing. It also makes a nice pot plant when planted several to a pot. A market for this small amaryllis has failed to develop and few are being imported. *Amaryllis belladonna* L. will set seed and can be used in hybridizing for small flowering sorts if one is interested in this type of amaryllis. The amaryllis "Gracilis" from India is both cheap and of good quality but a market for these has also failed to develop. These also make a wonderful pot plant when planted several to a pot. It is hoped that more interest will be shown in the small amaryllis as they merit our attention.

The growing of amaryllis commercially in the United States has decreased while it has increased in other countries. One firm in the Bahamas is now growing an improved strain called the Calypso Strain. The quality of these bulbs is very high both in flower and condition of bulb. These amaryllis are apparently grown under the most ideal conditions and the bulbs are very clean in appearance and they make vigorous growth. The firm at first had much difficulty in getting bulb size and a high percentage of bud set but changes in culture this past season indicate this difficulty is being overcome. They are confident that their bulbs will be as reliable as the Dutch and South Africa bulbs. The amaryllis from the Bahamas being raised in a warm climate under ideal conditions will eliminate any trouble from red blotch often experienced with other bulbs. By harvesting early and pre-treating experiments this season indicate that they can have amaryllis on the market to flower easily by Christmas, as the African and the treated Dutch bulbs do. The bulbs from the Bahamas I have flowered are exceptionally easy to force. The hybrids now offered are mostly red or mixed colors. The firm in the future plans to produce almost all of their bulbs by cuttage; first to be sold by color and later as named varieties. Here as with the amaryllis from the African growers the hybridizer favors the Warmenhoven Strain.

One grower in Hawaii is producing commercial quantities of amaryllis. This past season a number of different kinds were tested. The percentage of flower spikes were exceptionally high. Many bulbs made three spikes and some four. Flower size was not as large as desired however, many of these hybrids had extra nice color and many new shades of color. Of particular interest were the Dutch and Australian hybrids. This series of hybrids had some extremely beautiful rose shades among them. The Dutch and Australian crosses also appear to be the most vigorous and have the best flowers. It is believed that this firm will devote most of its attention to the Dutch and Australian crosses and develop its hybrid from these seedlings, as an Australian strain.

The amaryllis fan still prefers to buy the named clones. It is believed, however, that with the improvement in quality of the unnamed hybrids on the market more interest will be shown in growing amaryllis. The so-called "Dime Store" or cheap amaryllis are disappearing from the market and the medium priced better hybrids will eventually eliminate the inferior ones. Over production of the better hybrids will occur before this market is developed. This is one of the greatest problems of the grower. It creates a flooded market and prices fall below production costs and the good hybridizers give up the ghost. Over production is one of the greatest enemies of the amaryllis grower.

The trend in amaryllis breeding appears to be changing. While the solid colors are still popular more of the two tones and blends and distinctly marked varieties are appearing on the market. This is a welcome trend as it gives character to each clone not obtained with the solid colors. The shades in the colors are also being expanded. This all tends to make these flowers more interesting. I think the hybridizers

have neglected type of flower generally and this is especially true with the Dutch. However there is some indication that they are giving this a little more consideration. The new picotee types and the striped varieties show this trend. There are many interesting types of flowers that can be developed particularly with the medium size flowering kinds that should make good cut flowers and worthy arrangement material. Amaryllis are used to some extent in Europe as cut flowers now. We in this country have neglected this use of amaryllis. *I would like to see all members of the Amaryllis Society grow a few flowers each year for this purpose.* Winning a blue ribbon in an amaryllis show is fine but let us make the amaryllis something more than a show flower. It could become more popular than a rose and everyone should either have one in a pot or in the yard. Many people are not interested in shows but I feel each of us can get our neighbor interested in growing amaryllis, at least one, for their own enjoyment. They are a wonderful plant especially as a winter pot plant in the north even if they can not be enjoyed as border subjects.

Getting back to trends in amaryllis. It appears that the hybridizers are recognizing color-types and are breeding to duplicate or improve on a clone that has proven popular. I feel 'Margaret Rose' and 'Sweet Seventeen' are good examples of this. They are very similar—one can argue which is best. These two clones have both been popular. Now Van Meeuwen has a similar clone in 'Loveliness' and another firm has also a similar clone named 'Day Dream'. Other competition is also being developed. Ludwig's 'Love's Desire' is a very beautiful and popular color. Van Meeuwen's new clones. 'Rose Marie' and 'Pygmalion', are very similar. Another firm has introduced 'Rosy Dawn'.

'Apple Blossom' is an exception to this trend. It appears that it has been accepted as a standard and almost all are raising it under its registered name. It is a very nice color shade and a vigorous grower, a fine amaryllis and will be around a long time. Other clones I am sure, will be recognized as standards and will be grown universally.

The new clones on the market this past season were not numerous. Possibly the most noteworthy was Van Meeuwen's 'Siren of Paradise' and 'Pygmalion'. 'Siren of Paradise' is an extremely tall flowering white with just a pencil stripe of red in it. It is also rather large and a most impressive amaryllis. It will compete with 'Marion' and 'Peppermint' both of the same type. 'Siren of Paradise' will make a wonderful show clone. I understand it is very difficult to propagate so it may be discontinued. Those who are fortunate enough to get it will find it a wonderful clone.

'Pygmalion' is similar to 'Love's Desire' and also possibly the best substitute for 'Little Diamond'. It is pink and white, very beautiful and a most free flowering and vigorous growing clone.

Ludwig's new, 'Beautiful Lady' and 'Heaven Sent' caused quite a bit of comment. 'Beautiful Lady' is a new salmon, said to be an improved 'Bouquet'. It has to be good. 'Bouquet' has proved to be an

excellent clone. 'Beautiful Lady' and 'Rilona' are outstanding new salmon clones.

Ludwig's 'Heaven Sent' was well received and caused a lot of comment. It is a beautiful new light shade of rose pink. Many rave about this one.

Though the season was marked by late flowers, generally the quality of flowers was good. I watered my potted plants much too early in the season which caused more leaf growth and reduced flower sizes but generally I got a good percentage of flowers.

The following is my observance of the past flowering season. If I do not mention your favorite clone please remember this is an informal discussion, and I can not cover all of them and could just forget to comment on the one you like best or I may have neglected to observe it.

WHITE HYBRIDS

The white amaryllis are always popular particularly with the beginner. While Warmenhoven's 'Oasis' is considered tops by many that have it, Van Meeuwen's 'White Christmas' has much greater distribution and nearly always is liked. I have had many say it was absolutely tops in performance. It gets rather large, is very free flowering and I have had claims from several sources saying it will flower several times a year. One lady, I believe, said she had six spikes on her bulb during the past year! 'White Christmas' is exceptionally free flowering and a wonderful clone. It is easily forced and can be classed as one of the better amaryllis regardless of color. Van Meeuwen's new white, "Mont Blanc" (will have to be renamed as Warmenhoven already has a clone with this name), is larger than 'White Christmas'. It is considered mainly a show flower and appears to be becoming very popular.

Ludwig's 'Christmas Gift' and 'Winter Carnival' are both fine whites and continue to be popular. The older Ludwig white, 'Marie Goretti' and 'White Giant', are still going strong. 'White Giant' will make a nice size flower from a small size bulb which should be of interest to the florist. 'Nivalis', although a poor commercial variety, (it rots easily in shipping) does very well in the border in the south. It is a good standard white and one of the best for outside planting.

'Overture' appears to be a white of merit. It grows tall and makes a flower similar to 'Ludwig's Dazzler'. It is fairly vigorous and many will favor it. 'Joan of Arc' and 'Leading Lady' are free flowering whites. Warmenhoven's 'Mt. Blanc', a very old clone, is very reliable and can be maintained in flower for many years. It is a good white. Many consider it at or near the top.

'Flying Cloud' is a good standard white. It is becoming more popular each year and will eventually be considered one of the better standard whites due to its free flowering and vigorous growing habits.

NEAR WHITES

The near whites or whites penciled red are becoming popular. 'Siren of Paradise' was added to this list the past season. It is a very tall large flowering clone and a fine show flower. It will give 'Marion' and 'Peppermint' strong competition. 'Marion' may flower larger than 'Siren

of Paradise' but it grows much shorter and is less spectacular when placed beside a 'Siren of Paradise' on a 30" to 36" spike that looks down at you. 'Siren of Paradise' *also has a delicate fragrance.*

RED WITH WHITE STRIPES

The red and white striped clones have never been very popular but with each improvement they are gaining favor. 'Streaking Stripes' is no doubt the most outstanding (in my opinion). It has beautiful form, *is fragrant*, and has a lot of green in it which really adds beauty to this amaryllis. Green in amaryllis has in the past been regarded as undesirable but one look at 'Streaking Stripes' will, I am sure, change your mind. 'Zenith' is still popular in a number of areas and Warmenhoven's 'King of Stripes' and older smaller flowering clones are finding favor with many who are turning to the medium-sized flowers as they are more dependable bloomers. Ludwig has several new striped clones. Their value will soon be determined. I feel a striped clone has to be different or very outstanding to be a success. Ludwig must consider the two tones or stripes are going to become more popular by the number he is introducing.

BI-TONE—RED AND WHITE

The bi-tone, red and white, series may be weak growers. 'Five Star General' was a most outstanding flower but propagation difficulties has just about eliminated it and one seldom sees a good flower of it. Its bright red is sparkling. In most similar clones the color is not as intense and is generally dull looking. 'Aphrodite' is a new red and white that is reasonably good—not as fine a color as 'Five Star General' but nice. 'Piquant' has nice coloring, much the same pattern as 'Candy Cane', but of a medium red and white rather than the orange-red and white. It has been seen by only a few people. It is, however, a worthy clone and deserves more attention. Ludwig's 'Happy Memory' is a nice new red and white. Named in honor of the late Mr. & Mrs. C. J. van Til, General Manager, and his wife, director and principal shareholder, of Ludwig & Co., who lost their lives in an automobile accident in 1961. See also page 25, PLANT LIFE, 1963, for brief In Memoriam notice. We will have to be happy with these until someone develops a new 'Five Star General' that will grow vigorously.

WHITE, FLUSHED PINK

The white flushed pink clones are becoming very popular as in this coloring we have our nearest true pink color. The solid colored clones are more rose pink. 'Apple Blossom' is the most popular white flushed pink clone and is being grown by many growers. In my opinion it is not as refined a color as desired, it is surely a vigorous grower and the coloring appeals to almost all people. It will be a leading commercial clone for an indefinite period.

PINK

'Little Diamond' is the nearest to a solid pink—a pin striped pink and white that appears pink. It is very flat and has perfect round form and is relatively large. Without a doubt it is considered to be the nearest pink and a leader in this particular color. It really has class. Being high priced and scarce it is considered a collector's item and few have seen it.

'Pygmalion' approaches the coloring of 'Little Diamond' but has more white in the throat. When raised in the shade it is a delicate pink and white color. It flowers easily and I predict that it will become extremely popular as it has all the makings of an excellent clone. 'Love's Desire' is a good white and pink clone with more pink than 'Apple Blossom'. Two new clones, 'Rose Marie' and 'Rosy Dawn', are very similar. All are good and time will tell which is best. This is a color that is becoming extremely popular and will possibly become more popular than the solid rose pinks. The Hadeco African clone, 'Pink Blush', is about half way between 'Apple Blossom' and 'Love's Desire'. Some may call it an improvement over 'Apple Blossom' as its color is more refined. It is large, grows vigorously and is a very beautiful clone. It ships poorly so may never become popular. 'Rosaline' is brick rose and white. The color is a little odd and it did not flower as well as usual this past season. It normally flowers easily and is distinctly different in color. I should not forget 'Pink Beauty' as it is a beautiful rose red and white that is extremely popular.

'Beacon' still reigns supreme in the salmon pink and white bitones. It has no equal.

BLENDS

In the blends 'Floriade', white flushed pink, is one of the most popular. Its companion, 'Golden Triumphator', is a golden bronze shade. It is also large and beautiful. 'Golden Triumphator' has taken on more color the past several seasons and often flowers near solid golden bronze with little white in it. 'Golden Triumphator' is still considered one of the most beautiful amaryllis by many and is good in hybridizing as its seedlings make robust plants as a rule. 'Pinksterflower', a blend of azalea pink (salmon orange) and white is a strong grower and a fine clone. 'My Fair Lady', a new color in red and white blends, is a most beautiful and different flower. Almost everyone who sees this amaryllis falls in love with it. In the lighter shades 'Margaret Rose', 'Sweet Seventeen' and the two new ones in this color, 'Loveliness' and 'Day Dream', compete for first place. In my opinion 'Day Dream' may be the best. It has wider tepalsegs and is a very fine amaryllis. Of course it has not withstood the test of time as have 'Margaret Rose' and 'Sweet Seventeen'. 'Cupido' is a new one that is a little different in color. It is more old rose and white. It grows tall and vigorous and has a rather interesting color combination.

SALMON

There are few amaryllis of merit but this color has some of the most outstanding amaryllis in it. 'Bouquet' has been among the best for a number of years. Van Meeuwen's new 'Rilona', a light salmon or salmon buff, is a most vigorous clone. It is lightly bearded which makes the flower very beautiful with a delicate ruffling effect. Ludwig's 'Home Decorator' has had a most unique color in the salmon shade being a bronze salmon. This is a new color in amaryllis which is a popular color at the present. 'Beautiful Lady', considered an improved 'Bouquet', is a most beautiful and worthy addition to this color. I do not see 'Beautiful Lady' competing with 'Bouquet' since 'Beautiful Lady' is solid colored while 'Bouquet' has a purple or violet midrib which, in my opinion, makes it distinctive. 'Queen's Page' is still popular among salmons. Generally the Warmenhoven bulbs are higher priced and do not have as wide a distribution as the Van Meeuwen and Ludwig clones. The bulk of Warmenhovens trade is still in unnamed clones. The other growers have named almost all of theirs.

ROSE PINK

In the solid rose pink clones, Ludwig & Co. until recent years were the only contenders. However, almost all Dutch growers produce clones of this color now. Of all of these I have grown I liked 'American Fashion' best. This is very reliable and beautiful. Unfortunately this clone was difficult to propagate and Ludwig & Co., discontinued it.

If I were to name the one I thought was the next best I believe I would have to say 'La Forest Morton'. There has been lots of discussion of the merits of 'La Forest Morton' but if its performance is anything consistent with that of the past season I have great faith in it. It is large, has delicate ruffled edges and is a very pleasing lavender rose pink. Van Meeuwen's 'Queen of Sheba', is fine. It has only one fault. The tepalsegs are so wide they tend to cup and do not allow the flower segs to reflex properly, a very fine clone otherwise. Ludwig's 'Flora Queen', is excellent. It, however, is very scarce. It is a light lavender rose pink and possibly the lightest color in this group. The new clones, 'Dutch Belle' and 'Heaven Sent', are worthy additions in this color. 'Catherine Valenti', 'Bellini', 'Dawning' and 'Fanny', are all nice clones, but being higher priced have not been evaluated to an extent. 'Fanny' is a new color in lilac pink and is very beautiful. Its color is much like 'Daintiness' except the color shade is different. It has a green heart as in 'Daintiness'. All who have seen it have commented on its beauty and different color.

ROSE RED

In the medium rose red shades the leader is possibly 'Bella Vista', a fine free-flowering medium rose red. 'Doris Lillian' is still popular. It is, however, being replaced by such clones as 'Queen of the Pinks' which is similar but larger flowering. 'Symphony' is still very popular. The new 'Trixie', has excellent color and is finding many friends.

In the dark rose reds Warmenhoven's are still the only ones available and all three are fine amaryllis. 'Bordeaux' is the darkest. 'Moreno' and 'Mysterie' being lighter but of different form.

ORANGE

There are not many amaryllis that approach the true orange color. 'Delilah' is the nearest to orange in my opinion. It is a fine amaryllis and possibly in a color class all its own. The new amaryllis 'Orange Orchid' is beautiful and outstanding. It has coloring similar to 'Orange Wonder' which has been very popular the past several years even though high priced. Anyone who likes orange amaryllis will like 'Orange Orchid'. 'Prince of Orange' is another fine tall orange amaryllis. The small Hadeco African amaryllis, 'Tangerine', is an excellent medium sized flowering amaryllis. It still is a grand performer. 'Terra Cotta' and 'Orangedale' perform well also.

BRIGHT RED

There are but few bright red amaryllis. This is a color I like but even I neglect. 'Red Emperor' and 'Red Star' are the only ones I can think of in this particular color at the moment. I do have several unnamed clones in this color that perform beautifully each year. I do not know why this particular color shade has been neglected but we should pay more attention to it.

MEDIUM RED

I think the medium reds as a whole are not a strong lot. Possibly the best one to date is 'Flamboyant'. This amaryllis has just about perfect classic round flat Dutch form. It is an eye catcher. 'Red Champion' is larger and a very fine amaryllis. These two possibly lead the pack. W. S. Warmenhoven's 'Scarlet Triumph' is large and leathery and fine. 'Ludwig's Scarlet' is large and fine, but its popularity seems to be on the wane. 'Ludwig's Goliath' is popular as it is huge. It has been scarce so has not been properly evaluated.

DARK RED

Everyone wants a good dark red but I find no one fully satisfied with those available. Possibly we would like for them to be darker. 'Mars' seems to be the new one that is most popular. Some however report it hard to flower while others report excellent results and huge flowers six to a spike. The best results seem to be obtained in California. I do not know why. My results in Florida have not been the best. 'Mars' can be spectacular. Warmenhoven's clone, 'Rotterdam', is making friends and is a very nice amaryllis. 'Ludwig's It' and 'Franklin Roosevelt' have many friends. 'Ludwig's It' at times flowers in the orange shade but this last year was a beautiful dark red.

WINE RED

There are several that belong in the wine red group. 'Red Master' has led this pack for years. While it is still popular it has not flowered as well the past few seasons. 'Alcyone' and 'Tristan' are good and still popular. 'Purple Queen' is considered by many as the best in this color.

ORANGE RED

I note in my discussion that I have left out the orange reds. If I were to pick a leader in this color it would be 'Rembrandt'. This one grows tall and flowers easily. The bloom is large and flat. At this moment I believe I would class this as one in my list of ten best amaryllis. 'Agatha', 'Apollo', 'Madame Curie' and 'Orange Nassau' are all beautiful and outstanding. Few are available and they remain collectors items. Anyone who has one of these in his collection is very proud of it. 'Cavalier' is a very large new orange red that deserves attention.

PICOTEES

No amaryllis fancier should be without a few of the Picotee type amaryllis. They are very artistic, of airy form, and very beautiful. Ludwig has had two named clones, 'Dutch Doll' and 'Square Dance'. Both were white with a very narrow red edge on each tepalseg. 'Square Dance' was light and airy with an informal form. Tepalsegs were not extremely wide. 'Dutch Doll' on the other hand has fairly wide tepalsegs. 'Square Dance' proved to be a poor shipper so it is being discontinued and replaced by the new 'Petticoat'. The unnamed clones sold as Picotee show quite a bit of variation in form and color some are being almost white while others are speckled and flushed red. All are beautiful and worth your consideration.

HADECO HYBRID AMARYLLIS

In evaluating the amaryllis I tend to forget the Hadeco African clones. These are raised from offsets so that one can expect them to multiply once they are planted in the border. To date the color range in these is not as wide as desired but each year some 10 new clones are evaluated so that eventually a complete color range will be available.

The first Hadecos named clones introduced were orange red. 'Orangedale', 'Terra Cotta' and 'Tangerine' in this group are all nice standard clones. There are now a number of good reds available—Clone 65, 'Firebrand', 'Red Rover', 'Redstone', Red Wing', and 'Ruby Glow'. All are of different color shading and some are of a particular shade of red not obtainable elsewhere. Not all of these are registered but it is planned that they will be by flowering season. Clone 236 and 'Rosedale' are very beautiful rose red clones, a little different shade than found in the Dutch strain. For early flowers the first year the hybrid amaryllis from South Africa are most worthy.

AMARYLLIS SPECIES

So much for the named clones, I have been interested in the species for some time and have a considerable investment in them. My interest in them is their evaluation in view of developing new forms, colors, sizes and growing habits. It appears when the flowering season draws near each year I am the busiest and fail to take proper notes on those I have and have completely neglected to take pictures. Fortunately Mr. Sam Caldwell has a number of species I have collected and he has taken pictures of some of the species as *A. aucica stenopetala* and *A. aulica*

playtypetala as published in the 1964 Year Book. Many people have obtained bulbs of the different species I have collected and I am quite sure your Editor would appreciate any pictures you might have of these when they flower. Send a copy of any of these you may have to your Editor.

Of the 40 to 50 different wild species lots I have collected a few have failed in culture, and have been lost. Many others will reach maturity this coming year and I do hope to find time to record the results.

This past season some flowered that had not flowered before. The one that most impressed me was a spike on species recorded as SA-5-60.

Fig. 34. *Amaryllis striata* Lam.: SA62-5. Rio de Janeiro, Cordeiro, Brazil, in the wild, flowering in September (southern hemisphere), alt. 830 m.; average temperature during growing season, 25° C. (=77° F.), in half shade; subsurface drainage. Collected for Mr. Robert D. Goedert by paid collector. Photo by Sam Caldwell of plant growing at Nashville, Tenn., without leaves at flowering time.

This bulb, about 1″ in diameter had a spike about 10 inches tall with two flowers about 2½ to 3″ in diameter. The flower was orange red with a yellow star in the throat and a very dark solid purple deep in the throat. The color was very clear with little or no striping. I had a notation on this bulb that it appeared different from the others in the lot so it may be a single odd bulb. The remarkable part of it was that the yellow in it was *a true yellow* very clear and the purple was vivid purple and no trace of any other color. The purple looked like someone had poured indelible ink deep in the center and made a blotch about ½ inch in diameter. As usual I was very busy at the time and did not get a picture.

I had several in the striata group. Possibly the most outstanding was SA62-3. This is a beautiful pastel pink blending to yellow with green deep in the throat. It is of airy form, possibly *A. striata crocata.* This species grows easily and should be useful in hybridizing for pastel shades. This species was gathered in Espirita Santo, Brazil and grows on rocks in full sun. Also in the striata group, SA62-5 flowered. This is a very tall reddish orange with a yellow green to white striated flower (see Fig. 34). This is a fairly regular form and is possibly *A. striata* var. *striata.* Another species, SA63-22 from Santa Catarina Island, Brazil, produced a small solid orange-red striated flower. This has a typical striata leaf and bulb growth and is very similar to the striata Mr. Hana found naturalized in Hawaii but is smaller and darker in color. It is believed to be *A. striata* var. *striata.*

One species that flowered this year for the first time was sent in as *A. blumenavia.* This is species No. 12/62. One flowered this spring—a relatively large flower over 5″ in diam., of crimson veined more deeply. The flower was compressed laterally. It appears to be the species *A. correinsis* var. *compressa.* This flower has amazing ability to catch the moon light and literally glows in the dark. I would assume it is pollinated by some night flying moth. It grows poorly for me, appears to belong to the aulica group wanting cool weather to grow but appears to want this coolness during the summer months as it apparently goes dormant much above 70° or below 60° F.

Species LM63-1 from San Martin, Peru is a worthy species being bright medium red with whitish-green throat. It resembles *A. belladonna* but is more trumpet shaped. It is a clear red with little or no yellow in it. In this group of bulbs there are some that are similar but the color is pink. As this species has little or no yellow in its coloring, I feel it may lead to a new series of hybrids of pure pink color as well as hybrids of bright red. This amaryllis surely deserves the attention of the hybridizers.

Another species that flowered was SA62-1, from Esperito Santo, Brazil. It was a very regular flat formed amaryllis in rose pink with white heart and appears to belong in the belladonna group. SA62-2 from the same area is very similar. The foliage on these appears very similar, however SA62-2 rots easily during warm wet spells whereas SA62-1 seems to like this condition.

Next season I should have a number of new species to flower. Many of these do well in North Florida and should prove good in hybridizing. May I suggest in your hybridizing that you use *A. aulica platypetala* as a seed parent. This past seasan I flowered several crosses between 'Floriade' and *A. aulica playtypetala.* These hybrids appear to be robust growing. They are late flowering—a month later than most hybrids. They produce very large flowers. The flowers were striped, very interesting and beautiful. This particular cross produced salmon, orange red and rose shades. This is a very interesting and worthwhile cross that anyone might try if he wants some amaryllis that are different from those of his neighbors.

plate with the knife. Be careful not to remove too much, but only sufficient so as to provide a flat face which will enable you to start scooping out the basal plate from its centre, i.e. at equal distances from the outer rim of the basal plate. The sharp-edged spoon is used for this operation. The hole, which is eventually dome-shaped, must be neither too wide or too narrow. It should have a surrounding wall of basal plate of about $\frac{3}{8}$" thick. The depth of the hole depends on the depth of the basal plate, but this does not vary much with mature bulbs. Nevertheless, scoop out to a depth of about $1\frac{1}{2}$" beyond the basal plate right into the pulpy matter of the bulb.

The bulb is now stood on its neck with the basal hole upward and the knife edge placed across the centre of the hole. Then cut to a depth extending about one third of the bulb. The second cut is made similarly, but at right angles across the first. These four sections are all likewise halved and the operation is once more repeated so that ultimately there are 16 cuts, all to the same depth. Care should be taken to cut straight vertically.

It will now be found that all the cuts have closed up automatically and this is where the use of the wedges comes in. If necessary, sharpen the points of the wedges—not like a pencil, but in the fashion of a chisel. Dip the wedges in the fungicide and insert them in the cleavages at the point where the outer scales attach to the basal plate. This operation is sometimes tricky on account of the closed up cuts. But by exerting pressure from inside the hole with the fingers, the cuts are forced open and the wedges more easily inserted. By experiment, I have found that unless the cuts are wedged open, the wounds appear to knit and development of offshoot bulblets is negligible. After wedging, semi-loose scale segments, which soon start decaying in the ground, are removed and the bulb is then dusted with copper sulphate powder to minimize the danger of fungus infection. The bulb is now ready for planting.

PLANTING

Even more so than in the case of ordinary bulbs, the need for effective drainage cannot be over-emphasized. The pot must be provided with a drainage hole at the bottom. First place a layer of drainage rubble at the bottom of the pot and just cover this with coarse sand. Now fill up with regular potting medium to a depth at which the basal plate would normally be placed in ordinary potting. A mound of damp clean sharp river sand is placed in the centre of the pot on top of the potting medium. Fill the hole in the bulb with damp sand and place it on the mound of sand in the pot, pressing in slightly, but not so much as to press the basal plate through the sand into the bottom potting medium. Heap some more of this sand around the bulb up to the terminals of the cuts. The pot is then filled up with potting medium to the normal height. I usually fill it up to the shoulder of the bulb with the entire neck above the soil. The pot is then given a normal watering.

AFTER CARE OF BULB

To induce rapid growth, the potted bulb should be placed in a warm sheltered location with plenty of sunlight. Direct sun rays during the heat of day should be avoided, although early morning and late afternoon sun is beneficial. Having regard to the fact that all roots have been removed, the bulb cannot "drink" water in a normal manner and, as in the case of incubator segments, the medium should be kept moist regularly, but not wet as in the case of a growing bulb. Overwatering during the period prior to development of young offsets will almost certainly cause complete rot. This development is a lengthy process and will try your patience. Bulbs also vary greatly in nature so that some may produce their young ones long before such signs are evident with others. Root growth develops simultaneously with the forming of new bulblets and this will be an indication when watering should progressively be increased. At a later stage, when there is no more doubt about the development of root growth on the young bulblets, periodical liquid fertilizing is recommended.

An experienced eye will readily determine when it is time for the removal and transplanting of the offsets. This stage is normally accompanied by signs of overcrowding, especially in bulbs with a tendency to multiply rapidly.

REMOVAL AND TRANSPLANTATION OF BULBLETS

Eventually the bulb will be ready for lifting and the detachment of its "chicks". Here again it will be found that the use of the knife is called for. Further mutilation of the bulb will be inevitable and care should be taken, wherever possible, to perform the dissection in such a manner as to ensure the attachment of a section of the mother basal plate to each bulblet, except in cases of obvious advanced weaning. It will be necessary to operate very delicately and not to damage any of the tender root growth. It is advisable to treat all freshly cut surfaces with fungicide.

PLANTING AND AFTER CARE OF BULBLETS

The young bulblets must be planted immediately after removal and should, in the process, be protected against wind and sun. If they are left lying about carelessly, the root system will be damaged and further natural growth seriously retarded. It will, therefore, be necessary to have the new pots or beds in readiness immediately to receive the bulblets after detachment. For further information on the planting medium and after care of bulblets, please refer to the following article on the Buller incubators.

GENERAL REMARKS

It is only natural that one would be very chary in attempting these serious operations on precious clones of which one has no duplicates, although, in fact, this article is actually intended for that very purpose. However, the method of propagation described herein may first be tried out and put to the test with inferior bulbs, the loss of which would not

entail any serious hardship. This will also provide the operator with sufficient experience and confidence later to apply the method to more worthy clones. After all, it will only be a question of waiting for one more season before taking bolder steps.

Be assured, though, that I have not yet lost one single bulb that I have subjected to this treatment, in spite of the fact that some clones gave me only very few offsets compared with others which were prolific. Likewise, some bulbs are by nature inclined to develop their young ones earlier and more rapidly than others. I have had as many as 37 offsets from one bulb and as few as 4 from the most stubborn.

The insertion of 16 wedges calls for patient and dexterous manipulation of the bulb, entailing appreciable expansion of wall around the hole, i.e. the surrounding slit shell of basal plate and scales. Should this procedure be found too cumbersome, I would suggest that, after quartering, the four sections be further divided into only three sections each, giving a total of 12 cuts.

After scooping and cutting, the possibility that a bulb will produce a bloom is exceedingly remote. Should, however, this miracle occur, it would have a most devitalizing effect on the bulb and the flower bud must be removed immediately after emergence. Most likely this warning is superfluous, because I have never yet seen a bud on even the most robust bulb after having been subjected to such severe mutilation.

In conclusion I take this opportunity of extending my best wishes for a successful season to all my readers and my warm regards to the many friends whose kindness during my last visit to your great country is always remembered.

VEGETATIVE PROPAGATION OF AMARYLLIS WITH BULLER INCUBATORS

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INTRODUCTION

The principle of the particular method of vegetative propagation applied by me during the past fourteen years is not one which I have invented or evolved. It was the outcome of research and experimentation by the late A. C. Buller who, at the time when I met him in the late forties, was under the impression that he was the only person in the world who practised such propagation with equipment scientifically designed for the purpose. No doubt, the units designed by him were unique and, even at the present moment, their construction and method of operation are most probably unknown to many.

In a previous article, I referred to these units which Mr. Buller called "Incubators" and I propose to continue the application of this term. At the time when Mr. Buller intimated to me his intention of giving up the breeding of *Amaryllis* and requested me to continue from the stage where he retired, he not only made available to me the cream of his collection which he and I jointly and severally selected, but he

also let me into his jealously guarded details of vegetative propagation.

I read in the 1963 Year Book that after his death, the residue of Mr. Buller's collection was acquired by some horticulturists in the Cape. It is only reasonable to assume that those horticulturists for whom this privilege is claimed also acquired Mr. Buller's incubators or, at least, the knowledge of the method of their construction and operation. Besides, vegetative propagation of *Amaryllis* has been practised all over the world for very many years—since the 1930's (see Traub, "The Amaryllis Manual", 1958, for a summary).

Although I am a commercial breeder and grower of *Amaryllis*, I am not prompted by fear of competition to keep any specialised knowledge to myself. In fact, I welcome competition since not only I but the whole of South Africa and my overseas friends know what I have, what I have done during the past sixteen years and what I am still doing in the continuous improvement of South African strains and their public introduction.

Apart from the foregoing, it is my sincere conviction that any person with specialised knowledge who lays claim to being a true horticulturist, should not adopt the "dog in the manger" attitude, but should share his knowledge with his fellows. If everybody had selfishly guarded his knowledge, the establishment of an organisation such as the American Amaryllis Society would have been ineffective and the publication of the Year Book a fruitless effort. Hence this contribution!

THE INCUBATOR UNIT

The incubator was designed at a time when there were no rural electricity reticulation schemes in operation in South Africa and it was, therefore, a fuel burning unit heated with a kerosene burning lamp. Such was the nature of the incubator to which I was introduced and, apart from various improvements, including thermostatic heat control, I have not attempted to redesign it for electrical operation. Moreover, I have eight units in operation and they are so successful in their present operation that I have no intention of installing electric elements.

The complete unit, which stands on a simply constructed table of any suitable design—Fig. 36 (V)—comprises three major component parts, viz:

BOX—Fig. 35 (I); WATER PAN—Fig. 35 (II)—and MEDIUM PAN—Fig. 36 (III). In addition to these three components, reference will further be made to various accessories which will be separately described.

THE BOX—Fig. 35 (I). The box itself is an open-topped shell enveloping the vital components (water and medium pans) and it provides cavities at the bottom and on all sides of the two pans for the insertion of insulating material. It is 17″ deep, 48″ long and 28″ wide. Its construction is of 24 gge. galvanised flat sheet and, for the purpose of rigidity, the upper rim is rolled round a 6 gge. wire bent in a rectangle of the same inner dimensions as the box.

On the 28″ side, which is the front of the box, there are two circular holes of 2½″ diameter to accommodate the open ends of the heater

flue pipe of the water pan, i.e. the heat intake end and the waste gas escape end. The holes, measuring from their outer rims, are 3″ above the bottom of the box, 7½″ from the corners of the box and are spaced 8″ apart.

Since the bottom of the box has to be covered with insulating material which would be squashed flat by the burden of the water and medium pans, it is necessary to lay two parallel pieces of timber, 3″ wide x 2″ thick, along the length of the bottom of the box in line with the holes. These supports are, in any case, necessary so as to ensure that the flue ends of the water pan are held on a proper level to pass through the holes in the box.

THE WATER PAN—Fig. 35 (II). The open-topped water pan which is 7″ deep, 44″ long and 23″ wide, is constructed of 22 gge. galvanized flat sheet. On the 23″ side, i.e. the front end of the pan and 1″ from its bottom, two similar circular holes of 2½″ diameter spaced 8″ apart are provided through which the two ends of the flue are to pass. The flue, in the shape of a U, is also made of 22 gge. galvanised flat sheet just like a rainwater downpipe. The outer curve of the U passes about 5″ from the back wall of the pan whilst the open ends protrude 2¼″ in front, permitting an external protrusion of ¼″ through the holes in the box when the pan is placed in position.

The water pan must, of course, be soldered water-tight at all seams and joints, including those around the flue where it passes through the holes at the front of the pan. The bend of the flue need not be half circular but may be rectangular in construction and should be supported by soldering a stay or bracket from its underside to the bottom of the pan at the back end.

When correctly filled, the pan will have 1″ water below the flue pipe and the level of the water should also be 1″ above the flue. This means that the pan is filled to a depth of 4½″ and should constantly be kept at that level, with a space of 2½″ between the water level and the rim of the pan. For the purpose of checking and regulating the water level, a metal dip stick 21″ long with a notch 4½″ from the bottom must be provided, since there are no other means of determinnig the water level when once the unit is assembled and in operation. I did not find it necessary to show a diagram of the dip stick which can be made of ⅜″ round steel.

THE MEDIUM PAN—Fig. 36 (III). This pan which is 9″ deep, 45″ long and 24″ wide is also made of 22 gge. galvanised flat sheet. It is open at top and bottom and the latter is provided with a metal screen on which the medium rests. At the bottom end, on the inside of the pan, it is fitted with an exact fitting rectangular steel frame constructed of 1″ x 1″ x ⅛″ or 3/16″ thickness equal angle iron, to provide a protruding 1″ flange on all sides around the inside of the pan and 1″ from its bottom end. Along the bottom 1″ of the pan the other side of the angle iron, i.e. the vertical side, is secured by riveting or spot-welding to the sides of the pan.

When fitted on top of the water pan which is 1″ smaller overall, the bottom end of the medium pan will overhang by 1″ on all four sides around the water pan. The one side of the angle iron frame (vertical side) will form a loose-fitting collar around the brim of the water pan, whilst the other side (horizontal side) is the flange which rests on the rim of the water pan and holds the medium pan firmly in position on

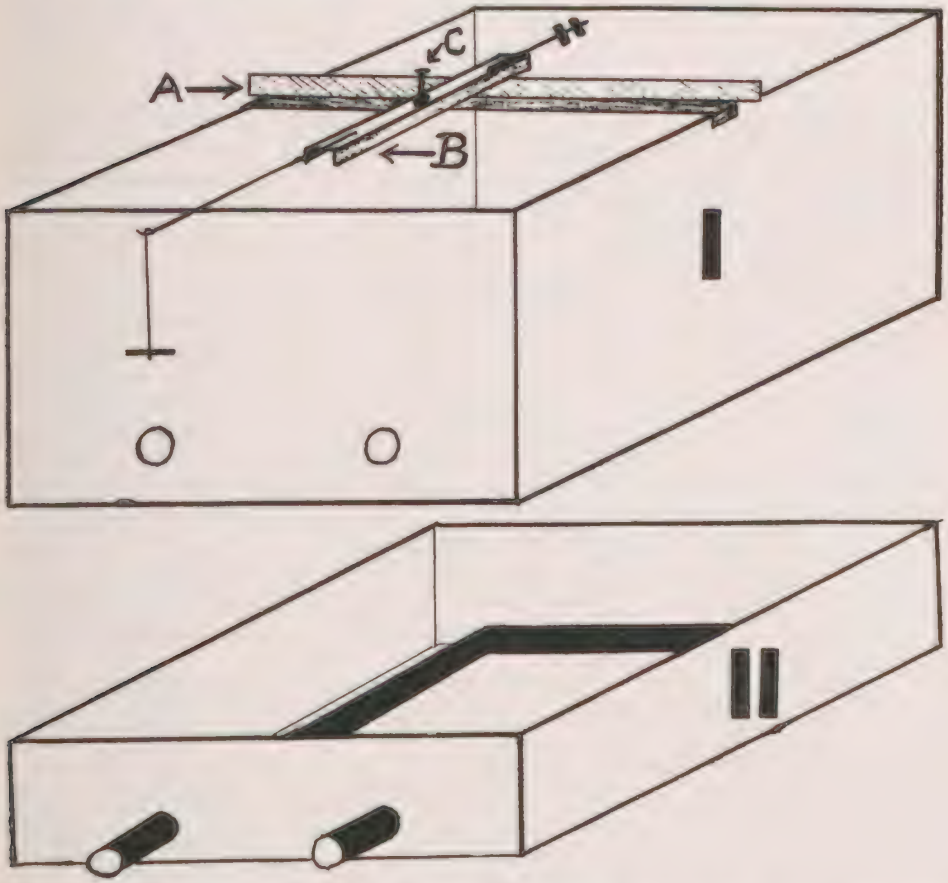

Fig. 35. Incubator unit: Box (I), and Water Pan (II). See text descriptions.

top of the water pan. This flange also serves to hold the metal screen of ¼″ mesh which forms the bottom or floor of the medium pan. The screen should be of galvanised wire of a gauge not less than 10 s.w.g., since it must be sufficiently sturdy to carry the burden of the medium in which the bulb segments are inserted. The screen is cut to size and laid on top of the flange formed by the angle iron inner frame to which it is then welded.

In one corner of the screen a hole is made for a ½″ pipe. This pipe, 9″ long, passes through the hole to a length of 1″ at its bottom end, where it is welded into the corner of the angle iron frame. At the top end, where it is level with the top of the pan, it is held firmly in its vertical position by a welded metal corner brace. This piece of piping which is not shown in any of the diagrams, is most essential because it is through this that the dip stick passes to determine the water level, and through which water is also poured with a funnel to maintain the proper level.

OTHER ACCESSORIES

THERMOSTAT—Fig. 36 (IV). The thermostat is also a home-made contraption. It is placed at the bottom of the medium pan, about in the centre at the same level as the bases of the bulb segments.

It comprises a gas-filled thin metal wafer or diaphragm encased in a metal container to which is fitted a length of copper tube. The wafers that I use, I see, are made in the U. S. A. and are used in fuel heated chicken incubators. It contracts and expands according to changes in temperature to which it is extremely sensitive. The metal container, which must be sealed air-tight, is to protect the wafer against moisture and relieve it of any pressure other than that of the push rod which operates the damper lever. For a metal container, I use an ordinary boot polish tin of the correct size to hold the wafer. A hole is made in the centre of the lid of the tin into which a 6½″ length of ¼″ copper tube is soldered, so that at its bottom end only a fraction of an inch protrudes inside the tin above the hollow on top of the wafer on which the one end of the push rod rests. The push rod is a 7½″ length of 12 gge. galvanised wire, sharpened at both ends and it moves freely up and down in the copper tube. It rests in the hollow on top of the wafer and extends about 1″ above the copper tube, where it makes contact with the thermostat control screw.

The metal container, which for months remains embedded in the wet medium, should be given several layers of a corrosion resistant coating to prevent rusting.

KNIFE-EDGE CROSS ANGLE—Fig. 35 (I-A). Please refer to Fig. 35 (I) since I could best illustrate it in that diagram. The cross angle is a 3″ wide x 32″ long strip of 24 gge. galvanised sheet bent to a 2″ x 1″ angle. This is snipped in the bend for a distance of 2″ on either end and the 2″ horizontal ends bent downward at right angles. The cross angle, with the 1″ side upward, is then placed about centre on top of the box across its width and the two bent ends clamped tightly over the sides of the box. Although tightly clamped, it can still be moved backward and forward so that the control screw may be brought exactly over the push rod. The two ends of the 1″ vertical side of the angle may be snipped off so that there is just enough left over to rest firmly on the rim of the box.

DAMPER LEVER—Fig. 35 (I-B). Here again this is best illustrated in Fig. 35 (I). The damper lever comprises a channel section, two pieces of 6 gge. galvanised wire, a couple of large steel nuts to serve

as balance control weights and a thermostat control screw. The channel section is a 2″ wide x 9″ long strip of 24 gge. galvanised sheet bent to a 1″ wide x ½″ deep channel. To the two ends of the channel, on the outside of its 1″ side and along the centre for about 2″ from the ends, are soldered the ends of the two pieces of 6 gge. wire—the one to extend 22″ beyond the channel to hold the damper and the other to extend 15″ to hold the balance control weights. The latter are large steel nuts with pieces of cork inside them, through which suitable holes are made so that the nuts do not slip too loosely over the wire.

The thermostat control screw—Fig. 35 (I-C)—which is very much enlarged in diagram Fig. 36 (V), is a ¼″x2″ galvanised verandah bolt with its nut. A ⅜″ hole is drilled in the centre of the channel section, somewhat off the middle toward the damper end, and the nut is soldered over the hole, so that the bolt when screwed into the nut may pass through the channel section. In the end of the bolt, which may first be filed flat, a shallow hollow is drilled into which the upper sharp end of the push rod fits, so that it does not easily slip off the control screw.

LAMP STAND—Fig. 36 (V-A). This is a simple little table of no particular design which can be knocked up with any odd pieces of scrap planking.

LAMP—Fig. 36 (V-B). This is just a regular kerosene burning chicken incubator lamp, fitted with the usual chimney with a mica covered peep hole to watch the flame.

TEE PIECE HEATER FLUE—Fig. 36 (V-C). This T piece, which like the water pan flue is made of 22 gge. galvanised sheet, takes the heat from the lamp through the water pan. Its cross piece, which is a tiny fraction smaller than the water pan flue, fits into the ¼″ protruding end of the water pan flue. Its bottom end fits over the lamp chimney, whilst the top end is opened and closed by the damper. In order to conserve heat, I do not leave the T piece exposed, but have encased it entirely in a covering of asbestos cement to within 1″ off the end of the cross piece where it fits into the water pan flue.

DAMPER—Fig. 36 (V-D). This is a 3½″ diameter metal disc suspended by a piece of thin wire through its centre, from the end of the damper lever. This damper I also give a top covering of asbestos cement. After fixing the one end of the wire through the centre of the damper disc, the other end should not be cut until the entire unit has been erected and the damper lever sensitively balanced on the knife-edge cross angle. The damper is now brought in position to close the heater flue at the top and the suspension wire bent at the end, at the correct distance from the damper, into a hook which rests on the end portion of the damper lever. The wire can now be cut beyond the hook.

When balancing the damper lever, see that the damper is correctly over the heater flue and the thermostat control screw is immediately over the push rod. Two tiny sharp notches are then made in the edges of the channel section where they rest on the knife-edge of the cross angle. This will help to keep the damper lever in the correct position and prevent shifting. The damper lever is sensitively balanced by shifting the

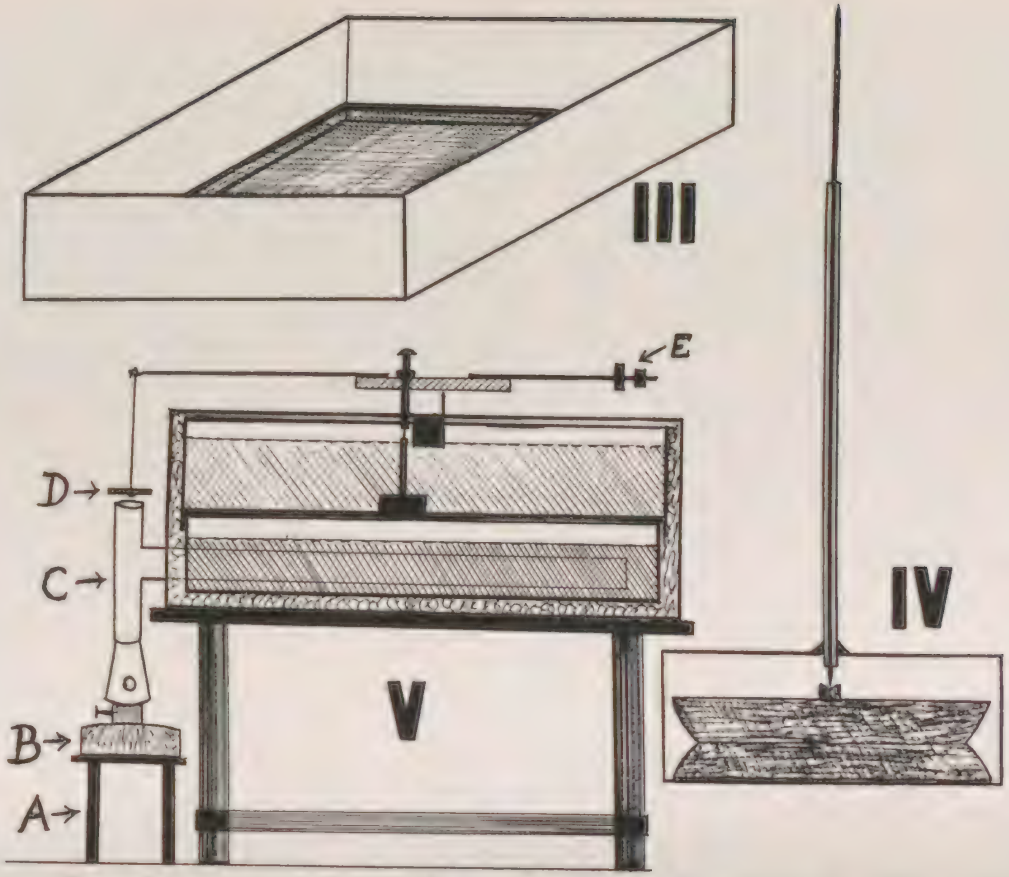

Fig. 36 Incubator unit: Medium Plan (III), thermostat (IV), and comeplete assembly (V). See text descriptions.

control weights—Fig. 36 (V-E)—until they almost lift the damper from the heater flue. There will then be practically no pressure on the thermostat wafer and the slightest expansion will cause the push rod to lift the damper lever and thus raise the damper off the flue. These adjustments, of course, are not made until the whole unit is in operation.

THERMOMETER. Although it is not shown in any of the diagrams, it is of such importance that any attempt to operate the incubator would be completely futile without the thermometer. I have found a dairy thermometer to be the only suitable one. It is sufficiently long and appropriately graded for the mercury to be visible above the medium from 80 degrees F. upward and readings easily taken. Proper heat control is thereby assured.

THE PROPAGATION MEDIUM

The medium in which the bulb segments are placed should be inert and free of organic matter which might cause the segments to rot. It should also have moisture retentive properties. I successfully use 2 parts cleanly washed coarse river sand, 1 part charcoal screened ⅛″ to ¼″ and 1 part exfoliated vermiculite similarly screened. Both the charcoal and vermiculite must be definitely free of dust. These ingredients should be thoroughly mixed.

ASSEMBLY AND PREPARATION

The unit is assembled as shown in Fig. 36 (B). The box is placed on its stand. Two lengths of 2″ x 3″ timber are laid on the bottom opposite the holes and the whole of the bottom covered between and around the timber with insulating material such as vermiculite, glass wool or dry sawdust.

The water pan is next placed in position with the ends of the flue fitting through the holes in the box and water poured into the pan to a depth of 4½″.

The medium pan undergoes prior preparation before being placed on the water pan. First a layer of teased coconut fibre, or coir as we know it, is placed on the screen at the bottom of the pan and firmly pushed down by hand to a thickness of about 1″. Make sure that the entire screen bottom is well covered with the coir which is then thoroughly soaked with water. On top of this, place a ½″ layer of well damped medium. Although thoroughly damp, the medium should never be soaking wet. The medium pan is now ready to be placed over the water pan in the box. The bulb segments with the base downward can then be placed on this prepared bed and covered with wet medium. Here again, the medium should not be soaking wet because that will cause rot. The thermometer is also placed on this bed in an upright position close to the thermostat and with its mercury bulb at the level of the base of the segments. The thermometer, naturally, is placed in position only when filling up with medium reaches towards the middle of the pan.

The medium pan is of a size which will accommodate 15 rows of segments, allowing 3″ for each row as it is packed in, starting from the back of the pan and working forward. I actually use galvanised flat

sheet partitions of 4″ x 23½″ long which I place between the rows of segments and these remain in place until I remove the bulblets. The partitions are equally spaced and kept in position by resting against tiny lugs spot-welded to the sides of the pan. The rows of segments are thus progressively filled up and covered with medium as they are placed on the prepared bed of the pan. Partitioning also prevents the different varieties of bulblets from mixing when taken out. A covering of medium to ½″ over the tops of the segments is enough.

The cavities between the pans and the walls of the box are now carefully filled, from the bottom upward to the rim, with insulating material such as was placed on the bottom of the box under the water pan.

Next, the control screw is adjusted so as not to touch the push rod, the damper is seen in position on top of the flue, the damper lever is sensitively balanced as already described, the lamp is filled and lit and placed in position under the flue. The height of the lamp stand is such that the top of the lamp chimney can almost touch the bottom end of the heater flue. The lamp is then lifted so that its chimney fits into the flue and a couple of old magazines or a piece of plank inserted under the lamp to keep it in position. This padding can readily be retrieved when the lamp is to be removed for filling, lighting or wick dressing.

Carefully keep an eye on the thermometer and as soon as the temperature rises to 80 degrees F., the control screw is finely adjusted so that the damper will start lifting with any increase in temperature beyond 82 degrees F. and close again with any drop in the heat. The optimum temperature is 82 to 83 degrees F. and temperatures from 85 degrees upward are harmful to the segments, whilst temperatures below 80 degrees retard development. The operator will by practice soon learn how to adjust the control screw and to lower or raise the flame of the lamp with the heat of warm days or the cold of chilly nights.

Except during hot dry spells, it will not be necessary often to wet the medium from the top. Should this, however, become necessary, apply water through a fine rose and do so sparingly to avoid soaking. Normal evaporation from the heated water pan is sufficient to maintain constant moisture in the medium in the region of the segment bases.

After a period of about 4 months, the little bulblets should be sufficiently advanced for removal from the incubator and can then, without detachment from remaining parts of their original segments, be planted in a growing medium such as is normally prepared for young seedlings. For some time, however, until they are properly established, they require a little pampering and should be protected against the heat of a severe sun and also against cold.

So much has already been written in previous Year Books on the preparation of bulbs before cutting—and the manner in which the segments are cut, that I have not thought it necessary to touch upon that aspect in this contribution. As regards the time of year for incubation I must however, stress that the incubators are put into operation and the bulbs cut at the very height of dormancy and immediately before the advent of the new growing season.

MY EXPERIENCES WITH HAEMANTHUS KATHERINAE

Arthur Hoerl

When I obtained my first bulb of *Haemanthus katherinae* it was an extremely rare plant. That was, as I recall it, nearly twenty years ago. Today this hardy plant, stately even without its exotically-beautiful bloom, is still quite rare; yet I can say out of my own experience it is getting around. I would wish that everyone who has a love for plants and flowers had at least one specimen to enjoy. Perhaps such a hope may yet come to pass.

I should say, first, that I am merely an amateur in floriculture, indulging in it for the pleasure it brings, for the beauty which derives to replace many hours that might just be prosaic. Fun there is too. Through it I have found friends at the far corners of the Earth: in Warwickshire in England, in Western Australia, Argentina, the Canal Zone, the Transvaal in South Africa, in India and Israel. It may be I shall never meet them, but by their friendly letters I know them, and through seeds and plants that we exchange we share each a part of our leisure lives. Except for this pleasant bypath I would not now be nurturing a *Fuschia* tree or an Elephantwood tree, raising wilding amaryllids native to the mountain slopes of Brazil and Paraguay, clivias that have been brought to perfection through years of breeding, liliums that have never been seen here. Pots and pans and borders hold exotic plants from many distant, romantic lands.

That is a unique kind of fun.

The common bond between all these far away friends has somehow always been forged by *Haemanthus katherinae*.

That first bulb of mine has flourished into many thousands of fruits, seedlings, flowering plants. *Haemanthus katherinae* (which may be abbreviated as H. k.) is a quite hardy plant and will flower in a pot or in the garden. In my area, the San Fernando Valley in Southern California, the temperature drops on occasion as low as 26 degrees at night. H. k. seems to thrive on it right out in the garden soil. In various experiments I have made in conjunction with a research program now in progress I have held young bulbs in the freezing compartment of the refrigerator for 2, 3, and 4 weeks. Then they were all planted out; almost all the bulbs survived and continued their growth. There were other specimens placed in a closet, shutting light out completely for a month or more in testing growth against photo period. The plants grew normally without light—all growth *stark white* of course. When the specimens were brought into the light they were green within 72 hours and went on to flower. So the plant seems to adapt itself to the environment, within limits.

A most extensive research on H. k. in many biological phases is now in progress and will go on for a lengthy period at the Department of Biological Sciences, Dartmouth College, New Hampshire, under the direction of Professor William T. Jackson. It was my privilege to be able to

furnish some hundreds of bulbs to assist in starting this research and I am still sending weekly specimens for dissection. This research has spread now into other fields including, I am advised, the medical. Facilities at such institutions as Brown University, the University of Florida, Texas State Teachers College, and North Carolina State are at work. I learn through correspondence that the University of Oregon is at the outset of its own research on *Haemanthus katherinae*.

It may be anticipated that papers on these research projects may be available in the not-too-distant future.

So, as I remarked, H. k. is getting around.

It may be of interest to other amateur growers to detail my method of propagation. The plant blooms for me starting in late June and through July. (Incidentally one of the avenues of the current research is the developing of the procedure to bring about all-year blooming). In order to bring it to fruit requires hand-pollination. Each bloom has up to a hundred florets in a nearly circular head often from 6 to 8 inches in diameter. Florets are pollinated individually. As high as 50 per cent fruiting can be obtained.

The fruit ripens to a deep red in late October and November. I extract the seed at once and plant in pans. When I have 1000 seeds or more to plant I often use flats, 1000 seeds to a flat. The planting mixture I use is 50/50 vermiculite and milled sphagnum, well moistened, a sterile mix. The seeds are pushed halfway into the mix. The seed is pearly and the green embryo is visible. Germination, usually 100 per cent, is from 10 days to 3 weeks, in the form of a radicle. Usually it seeks the mix; when it doesn't I prod it in gently. The bulb and roots form at the end of the radicle. Within another month the first true leaf comes out, the seed shrivels up and falls away.

I keep the seedlings for a year in the mix. (I have even kept them for 2 and 3 years and they continued to grow). From the mix they are potted individually in 4″ pots, graduating up each year. Blooms usually come the fifth year although I have had plants bloom in four years. Adult plants I have in 10″ pots, and even 12″. Some of the seedlings are also planted directly out in the soil. There may be a question about this procedure where there is extensive freeze and snow, although I have it from a friend who sent some of the plants to Colorado where they were planted out and survived and went on growing and flowering. But perhaps that would be a gamble because the habitat of the H. k. is Natal and Rhodesia where it probably does not get quite that cold.

Out in the garden is where H. k. grow most luxuriantly. I have had leafing past two feet and flower stalks of more than 36″. In Southern California the plants are practically evergreen, the new year's growth bursting out of the center of the leaf stalk while the leaves are still green. (I then cut off the previous growth to let all the strength go to the new growth). If the old growth does die off the new growth comes right up in February and March. H. k. may be considered dormant only in January in my climate. Another avenue of the present research projects is a study being made to induce enforced dormancy.

A few words about light reaction with H. k. may be of interest to those adventurous gardeners who might wish to experiment with this plant. All the specimens I have in pots and pans are kept out-of-doors (in fact, I never bring them into the house except to enjoy a bloom or in making some experiment) in a patio which is covered to permit filtered sunlight. Out in the borders the H. k. are located to be in partial shade, usually to allow them morning sunlight. Some are even in positions where they do not receive sunlight and only reflected light. As a test some specimens are planted in direct sunlight. In all positions they thrive, although those in direct sunlight show a slight fading of leaf color and are not quite as robust as those in semi-shade. In a shady spot the foliage is a charming shade of green, somewhat lighter than, say, *Eucharis and Clivia*. From my experience it would be suggested that the plant thrives best in partial shade or even in full shade with good reflected light. Also in such a situation the flowers will have no inclination to fade, the florets being a deep coral pink with anthers a deeper shade of coral, and pollen yellow. Truly a really beautiful picture.

As for fertilizing: perhaps that might make the plants even more robust. As an actual fact I have never fertilized any of my hundreds of plants aside from that contained in the potting medium. This is merely an idiosynerasy of mine. I keep my soil always heavily mulched and let the plants struggle for their own existence. It is merely my opinion that roots will go deeper in search of their own food and become sturdier and more disease- and pest-resistant. For example, I never spray my garden at all. If lady bugs and mantis are around let them get fat. This year I had hardly even an aphid. For potting, too, I have a formula, never using any loam soil: mixing shredded redwood bark, oak leaf mold, humus, milled bean straw, a bit of steer manure, vermiculite, and some bone meal.

I said I think it's fun. It really is.

4321 Vantage Avenue,
North Hollywood, California

CRINUM CULTURE IN MARYLAND

William W. Zorbach, *Maryland*

For a preliminary report, including directions for the preparation of a satisfactory soil mixture, attention of the reader is invited to Plant Life, *19*, 101-105 (1963).

Of special interest, at this writing, is a continued success in the wintering over of crinums. The original bulbs of *C.* 'Cecil Houdyshel', C. 'Ellen Bosanquet' and C. *powellii album*, planted along the south wall in the fall of 1959, are now handsome clumps and this summer (1964), the longer leaves of 'Cecil Houdyshel' attained a length of 6'. This year, the original lath shade was removed to prepare the area for a small conservatory, and the three subject crinums were exposed to a full and very hot sun. Under these conditions the three specimens appeared

to thrive and the writer was rewarded by twelve scapes on *C. powellii album* which were produced over the period June 15 to July 15.

The habit of these three beautiful crinums is distinctly different as handled in this area. Although 'Cecil Houdyshel' produced only 5 scapes this year, the first of these preceded by one week *C. powellii album* while the last finished blooming in late August. The outer covering of the stalks of two offsets of 'Cecil Houdyshel' are splitting at ground level at this writing, and because this phenomenon invariably precedes the appearance of a new scape on the main bulb, it is considered that the two offsets, by now having attained blooming size, are ready to produce scapes for the first time.

C. 'Ellen Bosanquet', in spite of the number of offsets and the clump it has produced, yielded only three scapes. This, however, may have been the result of "freak" weather late in March which had some severe consequences in the writer's garden. As noted previously, this *Crinum* is the most tender of the three and is the slowest starter in spring. This year we had a somewhat warmer March and by the 20th of the month, early items were springing up all over the place. *Tulipa praestans* and *Azalea mucronulatum* were beginning to flower, and *C.* 'Cecil Houdyshel' and *C. powellii album* were already 8-10 inches above ground. 'Ellen Bosanquet' was just pushing up and on March 25, when the air temperature reached 72°, everyone agreed that spring was here to stay. That night an arctic air mass pushed through the Washington area, dropping the temperature some 35-40°, and on the following night, the temperature fell to 20°. The cold weather persisted for three more days with the result that the new leaf growth on the crinums was killed back to the ground. This very likely weakened 'Ellen Bosanquet' to a point where its bloom this year was hampered. Needless to say, *T. praestans* and *A. mucronulatum*, which were in full bloom at the time, were a complete disaster. After twelve years now of observing Washington weather, the writer is forced to agree with an oft-repeated cliché: "If you don't like the weather in Washington, wait a minute!"

To add to such difficulties is the singular lack of rain this summer. Although there was adequate precipitation during the spring, little rain has fallen since May 1 and, at this time, we must be 10-12 inches in arrears. The drought conditions this year are worse even than in 1962. It is true that in isolated areas more rain has appeared than in others, yet such sporadic falls have miraculously avoided the writer's yard. Nevertheless, without any special care in watering, the crinums have performed well and, in view of their extensive root systems, they have proved to be very efficient plants.

New plantings were made along the east wall in the spring of 1963, and include *C. powellii album*, *C.* 'Ellen Bosanquet', *C. bulbispermum*, *C. asiaticum* and *Crinnodonna corsii* (syn.- *Amarcrinum howardii*). The soil along this wall was originally of a poor quality, being light clay, but was improved by the addition of a little sphagnum peat and much coarse sand. Although far from being rich, the soil has excellent drainage properties especially since the bed is raised 4" with respect to the

yard. During the summer of 1963, the newly-planted crinums did virtually nothing at all, spending such time in becoming established. Early this summer a single bulb of *C. scabrum* was planted in the bed, and shows the same behavior. At this writing (September) it has made only 12 inches of leaf growth.

In contrast, the plantings made originally in the fall of 1959 apparently became established in dormancy during the winter, and when spring arrived, they began growth without delay, reaching maturity in about two months. It is recommended, therefore, that crinums to be grown as hardy bulbs in this area be secured in the fall and planted deeply before the cold weather arrives. In this manner, they will be ready for spring growth.

Crinum asiaticum, which was planted 10″ deep as measured from the base of bulb (deeper than recommended), appeared to suffer the most from its reluctance to establish, primarily due to the character of the bulb. During the summer following planting, there was considerable withering and rotting of the outer layers, and when fall came, the diameter of live bulb was sharply reduced. The decision to winter over this species was a calculated risk, and after a hard frost killed back the little leaf growth which had been made, the bulb was covered lightly with wood ashes and leaves. Miraculously enough, this *Crinum* survived in this location and has been making slow but steady growth during the present summer. Also, the bulb has thickened considerably and it is the writer's prediction that blooms will be obtained later in the fall. All the other crinums planted in this location easily survived the winter, and this summer the newly acquired *C. powellii album* and *Crinnodonna corsii* have bloomed.

Perhaps it would be well at this point to further qualify growing conditions for crinums in the writer's yard. Both the south *and* the east are protected locations in the Washington area. East winds are rare and south winds in winter are quite warm. Cold air, on the other hand, comes either from the northeast or west; therefore, plants grown along the south and east walls are protected from freezing winds. Because the writer's home is of split-level construction having basement-type rooms in the east half of the house, both the south and east wall are heated to a depth of 5′ below soil level by warm air in the rooms. There is little doubt that some heat transfer through the walls to the soil outside is continuously taking place during the cold weather, and evidence for this is taken from the observation that offsets of the main bulbs form more readily in the direction of the wall. The implication to be drawn from this heating effect from the inside is not that this condition is necessary for wintering over crinums but, rather, that it must certainly offer a decided advantage over less auspicious locations. Without this added advantage, *C. asiaticum* most likely would have perished; indeed, this may have been a factor also in the wintering over of hybrid gerberas, which are planted alternately with the crinums. This has proved to be a desirable combination inasmuch as the former serve to provide color continuously during the summer and fall, long after the latter have finished blooming.

In closing, the writer cannot adequately extol the qualities of these fine plants. Of the various amaryllids grown here, the crinums are by far the most outstanding, and to describe them as magnificent is something of an understatement. Because of the warm weather and long growing season in this area, leaf growth is luxuriant and as landscape bulbs, they are peerless. Desirable also is the fact that they appear to be disease-free and not subject to attack by the usual garden pests. With a minimum of care and protection in the winter, they flower faithfully, becoming stronger each year.

Long live the genus *Crinum*!

September 8, 1964,
3602 Dupont Ave.,
Kensington, Maryland

GROWING WORSLEYA RAYNERI FROM SEEDS

[In 1962 and again in 1964, Mr. Robert D. Goedert, of Jacksonville, Florida, paid a collector to gather seeds of the Blue Amaryllis, *Worsleya rayneri*, from a mountain top in Brasil. These seeds were made available to his customers. It will be most interesting and helpful to record the successes and failures of those who have experimented with these rare seeds. Two reports were included in the 1964 Plant Life, and two additional reports are included in the present issue. It is hoped that others will send in reports of their experiments for publication in later issues without any special request from the editor.—*Editor*]

3. SECOND REPORT FROM MR. BURR CLOUETTE (CALIFORNIA)

My own single seedling of *Worsleya rayneri* has tripled in size. It is now quite thrifty; is evergreen, and seems to grow slowly most of the time. The first year it usually had only three leaves at any one time, and a rather weak root system. Of late it has had five leaves most of the time, and a few roots showing when the plant with ball of soil is lefted free from the 4-inch pot. I have watered it regularly, and feed it about every three weeks with fish emulsion. It is growing in a south window where it gets strong light all of the time, and about half of the day's sun.

Of six other seedlings given to me by Dr. Traub to raise, two died, but the other four are now growing well under "Gro Lux" lamps where they receive about 16 hours of light.

All five Blue Amaryllis seedlings are planted in "Black Magic" planter mix.—*P. O. Box 483, Rosamond, Calif. 93560*

4. REPORT FROM SAN ANTONIO, TEXAS, by Mrs. Robert E. Herold

Mrs. Paul A. Kane passed on to me in 1964, *Worsleya rayneri* seeds that had been sent to her from Mr. Robert D. Goedert of Florida. I was so pleased to get them. She remarked to me that they seemed to be very dry. I prepared a 3# ham can as my flat with a layer of charcoal from the barbecue pit, then a layer of sandy, humusy soil (begonia

mix) to within an inch of the top. In the meantime, I made a weak starter solution (Ferti-lome liquid root stimulator) in warm water and treated my seeds as I do sweet peas. I let them soak for about two hours. As I poured this water off the seeds—it moistened the flat. I counted the seeds as I planted and set each one on its side. I had 62 seeds in all. When all were set, I finely covered them with Michigan peat and then covered the can loosely with a strip of Saran Wrap. This was placed on the middle shelf of a Canada Dry display stand which make ideal pot stands on the north side of the garage. They were planted Aug. 31 and on Sunday, Sept. 13, I discovered 3 seeds up. Since that date, each day has been a revelation of new growth. I removed the Saran Wrap after three weeks. At the present time (Oct. 9, 1964), I have 54 distinct bulbils with tiny foliage almost 2″ tall.

ANDROSTEPHIUM CAERULEUM—BLUE WESTERN STAR

T. M. Howard, *Texas*

A member of the Allieae tribe in the Amaryllis family, *Androstephium caeruleum* is a very small genus that is most nearly related to *Brodiaea* and *Bessera* within the family, and like these cousins, it grows from a corm. This little corm has a loosely reticulated skin from which arise the 4-6 narrow grey-green leaves and the stout little 5″ scape topped by 2-6 fragrant upright facing bells of surprisingly hyacinth-like form and size. The fragrance reminds one of a freshly opened box of candy, and is very pleasing. The color of this little jewel is apt to be almost any shade of blue, of a frosty translucent quality, ranging from nearly white with just a hint of blue, to amethyst, French blue, and deeper violet tones, verging on purple. Indeed, *Androstephium caeruleum* provides those rich "true blue" shades that are so hard to come by in bulb collections. A colony of them flowering along roadsides in the wild is a joy to behold and a delight to jaded eyes, often bored by the commonplace fare repetitiously offered to dulled appetites year after year by commercial sources. Discovering these little "Blue Western Stars" for the first time is like sharing a secret that few others are privileged to know.

How strange it is that one of our most attractive native amaryllids is so nearly completely unknown among bulb growing hobbiests in this day and time. But the fact is that one may search for *Androstephium caeruleum* in books and commercial lists devoted to unusual bulbs, and it is seldom mentioned, and even more rarely offered. It may as well be non-existent! One can only wonder how or why it has apparently escaped the attentions of the commercial bulb specialists, as it has so many fine qualities that would appeal to gardeners, and it is no more difficult to grow than many popular bulbs. Perhaps it has been passed by because it has never been blessed with a fitting popular name. "Wild Hyacinth" is certainly descriptive enough, but other bulbs belonging to *Scilla*, *Camassia*, and *Muscari* genera also go by this loose term. It

has also been called "Funnel Lily", "Blue Star-of-Bethlehem", and "Blue Bethlehem", but none of these names seem to stick. The name, "Blue Western Star" has been suggested, and is adopted here.

Casually one might want to lump it with the *Brodiaea* clan, since its habits are rather similar, but close inspection of the indivdual flowers of *Androstephium* reveal that they have a character of their own that sets them apart. Imagine, if you will, the floret of a Dutch Hyacinth

Fig. 37. *Androstephium caeruleum*, Blue Western Star, flowering in its native habitat in southwestern Texas. Photos by Dr. T. M. Howard.

(*Hyacinthus orientalis*) to which has been added a tiny Daffodil-like crown in its center, which is however a stamenial-cup as in *Hymenocallis*, and you have a fair idea of the appearance of *Androstephium*. This little crown is formed by the union of the protruding filaments and this gives it its Greek name, *Androstephium*.

Androstephium caeruleum is a native of blackland prairies, said to be found from Kansas (and the Dakotas?) southward to Oklahoma and central Texas. It was collected by the botanist with the Mexican Boundary Commission in the 1850's. Up to the present, I have collected it only as far south as the Northern part of Bexar County, Texas. Thus it is a rather widespread little plant, but is never really common anywhere, and few people know it. In Texas it flowers fairly early in March

and April, after which it quickly becomes dormant and disappears for another year. A truly hardy plant, owing to its northerly range limits and its ability to withstand droughts, it should prove adaptable to many climates. Under cultivation it seems best satisfied in a sunny well drained alkaline soil, where it will not be watered while dormant, and it is for this reason that it is best suited for the wild garden. If in doubt, it should be dug when it begins to become dormant and stored in a dry place until fall, when it can be replanted.

Another species, *Androstephium breviflorum* Wats., is is said to be a similar, but more Western counterpart, and is said to range Westward from Colorado into Utah, Arizona, and south-eastern California. I have never seen this species and do not know what differences, if any, exist, but surely it too must be as charming as its prairie cousin.

SEVENTH GRADE SCIENCE PROJECT

Mr. Hayward called the Editor's attention to the project carried out by Mr. Frank A. Turner, and he was asked to give an informal report on his work. The following letter was received:—

507 Bon Aire Avenue,
Temple Terrace, Florida,
April 23, 1964

Dr. Hamilton P. Traub
5804 Camino de la Costa
La Jolla, California

Dear Dr. Traub:

As a seventh grade Science Fair project at the new Greco Junior High School in Temple Terrace, I chose Propagation of Plants—Without Seeds.

After referring to our Taylor's Encyclopedia, I wrote to Mr. Wyndham Hayward who sent me a copy of the Amaryllis Year Book with a good article on bulb splitting.

On October 29, 1963 I split one bulb of my Mom's dark red *Amaryllis* into four equal parts, being very careful that each part had a portion of the yellow stem. These were then planted in a mixture of sawdust and soil and kept well watered outdoors.

By the middle of February these four parts of the one bulb had each formed a tiny new green bulb from the stem and the old leaf was still crisp and green.

I had split a second bulb to show how this is done and it had been kept in a clear plastic wrap. This bulb by now had not started new bulbs but was blood red.

These were all displayed at our Science Fair on February 25, 1964, with about 700 entries, and I won the blue ribbon for first place in botany, for which there were 50 entries, with seventh, eighth and ninth grades competing together.

I am proud of the blue ribbon and this was interesting fun so I think I would like to find out now what else is true of *Amaryllis* bulbs.

Thank you for asking me to write you about my project. Mr. Hayward's help was encouraging.

Sincerely yours,
Frank A. Turner
Age—thirteen years

POPPED SEEDS, A DISEASE IN HEMEROCALLIS

Hamilton P. Traub

Most breeders of hybrid *Hemerocallis* have perhaps noted the condition which is indicated here as "popped seeds". This condition is characterized by seeds which have literally "popped" as in the case of popped maize (corn): the endosperm is partly turned inside out. In many cases the germ is loosened from the endosperm and is easily separated. Such seeds are usually a total loss.

It is possible that this conditon may be brought on by excessive moisture, but the writer has noted chiefly another kind in which susceptibility to seed popping is inherited. He noted that in such clones as 'Ann Rutledge', a pastel pink, at least part of the seeds, sometimes all of them, are popped no matter what the cultural conditions. It has also been noted that offspring from such clones also exhibit the abnormality to a greater or lesser degree.

Thus, the best method of control in case of the heritable type of "popped seeds" is to weed out the clones which exhibit this abnormality.

It will be interesting to hear reports from others who have had trouble with this disease in *Hemerocallis*.

CONTROLLING MEALYBUGS ON AMARYLLIDS

Sam Caldwell, *Tennessee*

Mealybugs have been a bane of my existence for many years. They get down between the leaf blades of clivias, amaryllis, nerines, sprekelias and other amaryllids, causing distortion of the foliage and, I have suspected, spread of the amaryllis mosaic virus. I've managed to keep the mealybug population down somewhat by using a mild oil spray, but have never been able to clean them out entirely.

Now, with the relatively new insecticide, dimethoate, I seem to be well on the way toward eradicating this pest. I use the formulation sold commercially as Cygon 2E. A simple spray application is effective, but experimentally I've tried dipping bulbs and submerging entire pots of growing bulbs—soil, foliage and all—in deep jars of the spray solution. If there has been any injury it is too little for me to observe.

CONTROLLING MEALYBUGS—continued on page 52.

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GENERAL EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

BOWLING GREEN STATE UNIVERSITY PLANTARIUM

William Easterly

This year our campus is being transformed into an attractive display of trees, shrubs and herbaceous perennials. We owe this achievement to the interest of our new president, Dr. William Travers Jerome. He recognizes the need of our University to provide an atmosphere of beauty as well as an atmosphere of scholarly activity. The plantings will be cared for by a full time horticulturist, Mr. Colen Wyatt. At the present time the campus can be divided into three distinct areas as far as the plantings are concerned; (1) general landscaping of the academic area and living quarters for the students, (2) landscaping of the athletic facility which includes a golf course, tennis courts and baseball field, and (3) an area devoted to seedling plants of a great variety of trees, shrubs and herbaceous perennials. The latter area is of special interest to our botany program and will eventually serve as a point of interest to the general public using our golf course.

Laminated plastic labels have been used to name the specimens. The letters are white on a red background. After a few years when the specimens have all been labelled, we plan to prepare a booklet describing our plantarium to campus visitors and friends.

It would be premature to compile a list of our plantings but we have favored maples, oaks, tulip tree, ginkgo, and moraine locust on the inner campus. The athletic facility includes a mixture of spruce, pine, fir, beech, linden, willow, oak, crabapple, viburnum, ash, honey locust, euonymus and a variety of flowering shrubs, and herbaceous perennials. Of special interest in the third area might be *Alnus incana*, *Amelanchier canadensis*, many species of *Cornus*, *Chionanthus virginicus*, *Callicarpa dichotoma*, *Aralia spinosa*, *Acer ginnala*, *Hippophae rhammoides*, *Larix decidua*, *Pinus aristata*, *Photinia villosa*, *Rhododendron amurense*, *Ptelea trifoliata*, *Rhamnus frangula*, *Rhodotypos tetrapetala*, *Rhus aromatica*, *Rhus trilobata*, several species of *Sorbus*, *Taxodium distichum*, and various species of *Paeonia*, *Hemerocallis*, *Lycoris*, *Ungernia*, *Narcissus*, *Sternbergia*, *Galanthus*, *Leucojum*, *Allium*, and other hardy bulbous, fibrous—or tuberous-rooted hardy herbaceous perennials.

NOTE TO AMARYLLID COLLECTORS

The following amaryllids are growing in my greenhouse in Bowling Green, Ohio. My goal is to obtain seeds from as many as possible. The seeds will then be sown and the plants raised to maturity. I would like to exchange bulbs or seeds with other collectors. My address is William Easterly, 506 Harvest Lane, Bowling Green, Ohio 43402.

The listing is as follows: *Amaryllis* species, LM63-1, from Peru; Iquitos, Peru; *Amaryllis moreliana*, from Brasil; *Zephyranthes* sp. (received as "*Cooperia* inolii"), grown in Texas; *Zephyranthes jonesii*

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D. Don (syn.—*Cooperia pedunculata* Herb.), grown in Texas; *Zephyranthes brazosensis* (syn.—*Cooperia drummondii* Herb.), grown in Texas; *Eucharis grandiflora; Habranthus robustus* (two lots, one from Brasil, the other received as "Zephyranthes robusta" from India); *Habranthus texanus; Hymenocallis speciosa*, received from Peru; *Rhodophiala bifida; Zephyranthes clintiae*, rose #154; and *Zephyranthes longifolia*.

TWO NEW BOMAREA SPECIES FROM PERU

César Vargas C., *Universidad Nacional de Cuzco, Perú*

My studies of the flora of Peru have led me to believe that certain species of the genus *Bomarea*, (Alstroemeriaceae), have not been previously described. I therefore undertake their descriptions as follows:

Bomarea tacnaensae (Fig. 38)

Erecta usque ad 60 cm. alta, caulis robustus apice recurvato, glabro, laeviter angulatus, altrovirens. *Folia*:—Linear-lanceolata, sessilia, 3.5-4 cm. longa, 6 mm. lata, atroviridis, subtus laeviter pilosa et ad caulem adpressa. *Inflorescentia*:—Umbela simplex, 7-11 radiata, bracteae lanceolatae, persistentes, 30-32 mm longae, 6-7 mm latae, albae, subtus pilosulae; radia 34-36 mm longa, bracteolae lanceolatae, 22-23 mm longae, 3-4 mm latae, subtus pauce pilosae, nutantes. *Perianthium*:—Segmenta 30-31 mm longa, suaequalia. Sepala lincaria, acuta, atrorubra, viride punctata, subtus alba, laeviter rosea, 7 mm lata. Petala spathulata, in apicem 12 mm, in basim 3 mm lata, flava et viridia, purpureo punctata. *Androceum*:—Stamina perianthi paulum longiora, antherae 3 mm longae, 2 mm latae. *Gynaeceum*:—Ovarium inferioris, purpureum, campanulatum, glabrum. Stylus staminibus brevior, tenuis, stigma styli non crassius.

This new species is an erect herb, up to 60 cm. high, the stem stout, strongly recurved at the apex, glabrous, slightly angular, especially at the recurved part, dark green. *Leaves*, linear lanceolate, sessile, 3.5-4 cm. long, 6 mm. wide, appressed to the stem, dark green, slightly pilose beneath. *Inflorescence*, umbel rays simple, 7-11, the bracts lanceolate, persistent, 30-32 mm long, 6-7 mm wide, minute, white pilose beneath. The rays of the inflorescence 34-36 mm long and the bractlets lanceolate noding at the base, 22-23 mm long, 3-4 mm wide, also slightly pilose beneath. Perianth segments 30-31 mm long, subequal. The sepals linear acute at apex, dark red with green tips, white and slightly pink beneath, 7 mm wide. The petals, spatulate, light yellow and green with dark purple tips, 3 mm wide at the base and almost 12 mm wide at the apex. *Androecium*, the stamen slightly larger than the perianth segments, 3 mm long and 2 mm wide, the anthers *Gynoecium*, Ovary inferior, dark purple, campanulate, glabrous. Style slender and shorter than the stamens; stigma as wide as the style. This species is close to *Bomarea praeustua*, but differs in its simple umbel rays, size and color of the perianth.

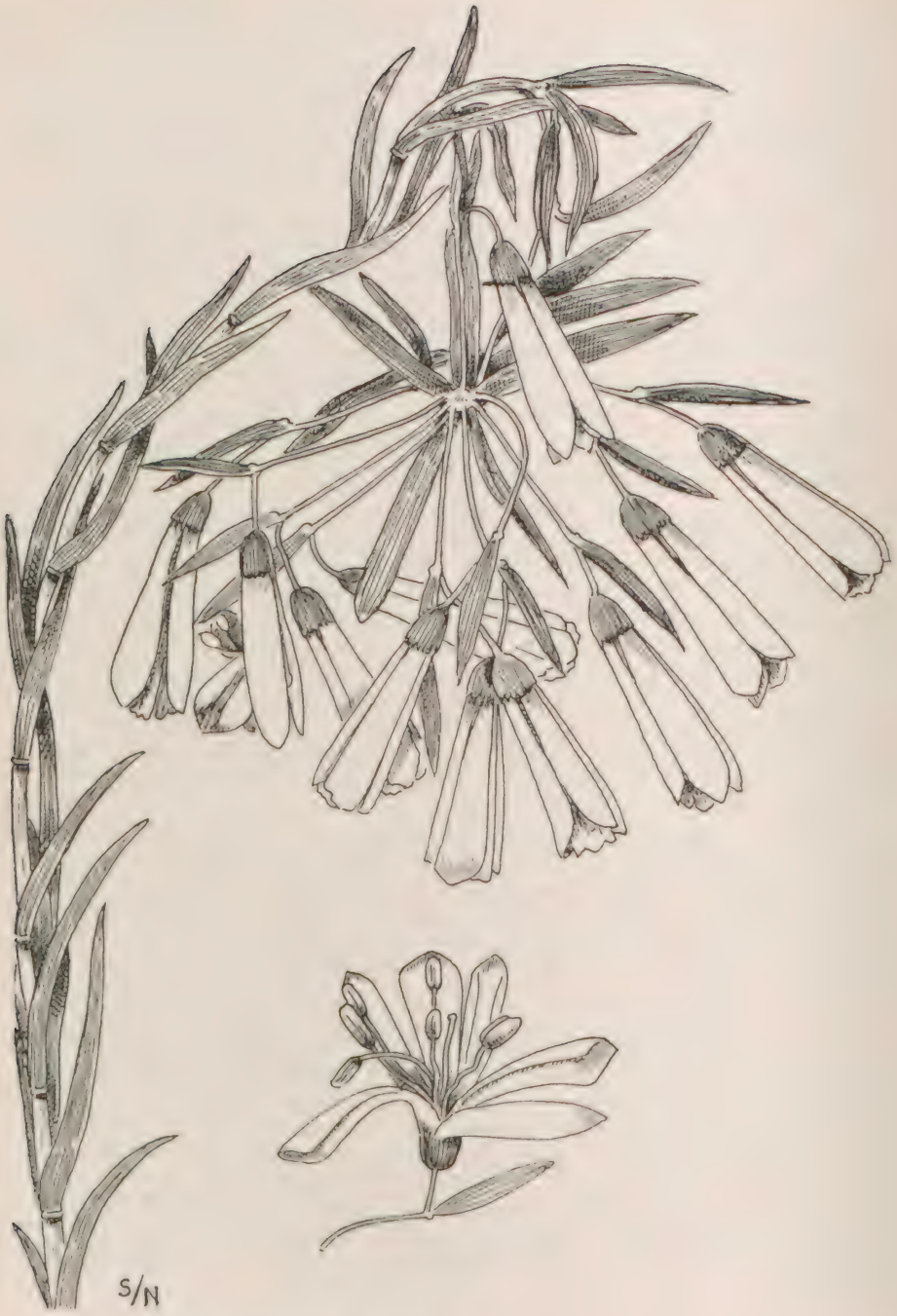

Fig. 38. *Bomarea tacnaensae* Vargas, *sp. nov.*

Fig. 39. *Bomarea longistyla* Vargas, *sp. nov.*

Type locality: Collected in Department of Tacna, Provincia, Tarata, between the pass of Livini and Tarta, at 3800 m alti. Habitat: on shrubby and rocky slopes. Type specimen: CVC., 13025, Nov. 1959; deposited at CUZ.

Bomarea longistyla (Fig. 39)

Suberecta, 70-80 cm. alta, caulis robustus dense pilosus, flavus et fuscus basi praecipue, apice albidus. *Folia*:—Plurima secunda, membranacea, glabra, subtus laeviter pilosa, ex parte centrali 6-8 cm. longa, 18-20 mm. lata. *Inflorescentia*:—Umbela 5-6 radiata, simplex, bracteae foliorum superiorum non longiora, radia 4-4.5 cm. longa, subangulata, pilis brevibus et glandulis obsita. *Perianthium*:—Florum bracteae longitudine et latitudine foliorum bene evolutis, aequalia. Flores 5-5.2 cm. longi, sepala atropurpurea ad apicem viridia 12 cm lata, petalis paululum breviora. *Androceum*:—Stamina 15 mm longa, exserta, antherae 5 mm longae et 2 mm latae. *Gynaeceum*:—Ovarium semiinferioris, atropurpureum, glabrum, campanulatum. Stylus 22 mm longus exsertus; stigma foliaceum.

This new species is a suberect herb, 70-80 cm. high, the stem stout, terete thick, pilosule, yellow and brown, especially at the base, and whitish near the apex. *Leaves* numerous and secund, membranaceous, glabrous, except beneath, which is slightly piliferous. The middle ones are 6-8 cm. long and 18-20 mm. wide. *Inflorescence*, umbel with 5-6 flower rays; the bracts of the inflorescence, as large as the upper leaves; the flower rays 4-4.5 cm long, minute pilose, glandular, slightly angular. *Perianth*, the bracts of the flower as long and as wide as the normal leaves; the flowers 5-5.2 cm long; the sepals dark pink 12 mm wide, slightly shorter than the petals. *Androecium*, the stamens are exserted almost 15 mm long; anthers 5 mm long and 2 mm wide. *Gynoecium*, Ovary half inferior, dark purple, glabrous, campanulate; the style long exserted 22 mm; stigma slightly foliaceous.

Type locality:—Collected in the Department of Ancash, Provincia Bolognesi, Mangas, Cerro San Cristóbal, between rocks, May 1962, by Dr. Emma Cerrate, #4123, Typus, at CUZ; Isotypus, Lima USM.

Cuzco, Perú,
October 31, 1963.

PLANT LIFE LIBRARY

EXTRACHROMOSOMAL INHERITANCE, by Dr. John L. Jinks. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1964. pp. 177. $4.95. This book is one of the short volumes in Prentice-Hall's Foundation of Modern Genetics Series. Dr. Jinks, the author, is Principal Scientific Officer of the Agricultural Research Council's Unit of Biometrical Genetics at Birmingham. He is well-equipped by experience and training to discuss extrachromosomal inheritance. His work with cytoplasmic inheritance in fungi, particularly with *Aspergillus*, has contributed much to this facet of genetics.

Sigmund R. Suskind and Philip E. Hartman of the McCollum-Pratt Institute, the Johns Hopkins University, are Editors of this series of books. According to the Editors the books are designed to "make possible a stimulating, selective treatment of the various aspects of genetics at the intermediate level". The author has conscientiously adhered to the limitations imposed by the editors; the book is clearly not a college text nor a reference work for graduate students and investigators.

Until about the 1940's there was little interest and not much was known about extrachromosomal inheritance except in higher plants where the classical work of Bauer, Correns, Renner, Rhoades and others, mostly with maternal inheritance of plastids, stood as lonely beacons surrounded by a sea of knowledge concerned with Mendelian chromosomal inheritance.

During the past two decades the picture has changed; investigators working with microorganisms such as yeast, *Neurospora, Aspergillus, Paramecium, Amoeba,* etc. have discovered many new, novel and important examples of extrachromosomal inheritance. At the same time, *Oenothera* workers have made fundamental discoveries in the field of extrachromosomal inheritance. Likewise, the thorough and brilliant work of Michaelis on cytoplasmic inheritance using *Epilobium* as experimental material is just commencing to be appreciated.

Dr. Jinks is concerned first with establishing a physical basis for the continuity of extrachromosomal constituents that might serve as bearers of hereditary determinants. There are two classes of extrachromosomal bodies that could conceivably qualify: (1) fiber-producers such as centrioles and basal granules, and (2) metabolic controllers such as mitochondria and plastids.

In the next few chapters Dr. Jinks has set-up rules for identifying extrachromosomal inheritance. Then follow chapters on the nature of the extrachromosomal system, relations between chromosomal and extrachromososal systems, and lastly the extrachromosomal role in development, variation and evolution.

The book is well written, and with few exceptions is free of the troublesome typographical errors that almost inevitably crop up in any book. The black and white diagrams are neat and informative and there is an excellent index. Surprisingly, the specific name of the Four O'clock, *Mirabilis jalapa* (*M. jalopa* in the book), is consistently misspelled, and unhappily, the black and white photographs from which the Frontispiece was composed did not reproduce well. For those geneticists and cell biologists who feel the need to up-grade their understanding of extrachromosomal inheritance, this stimulating book is highly recommended.—*Thomas W. Whitaker*

ECOLOGICAL GENETICS, by E. B. Ford. John Wiley & Sons, Inc., 605 Third Avenue, New York, N. Y. 10016. 1964. Pp. 335, Ill. $7.75. This book is a product of thirty years of research by a group in the Department of Zoology, Oxford University, under the leadership of Professor E. B. Ford, along with his close colleagues, Professor P. M. Sheppard and Dr. H. B. D. Kettlewell. The work was stimulated and encouraged by Sir Ronald Fisher until his death (the book is dedicated to him). Sir Julian Huxley has likewise maintained an interest in the experiments, contributing his customary critical comments and suggestions. From research spawned under these prestigious auspices one is tempted to anticipate an outstanding intellectual feast. The discerning reader with the patience to cope wtih the rather small print and 304 pages of text will not be disappointed.

Nearly all of the experimental work is concerned with animals, mostly invertebrates. The book actually amounts to a monograph of the ecological genetics of certain Leptodoptera, chiefly the butterflies, *Melitaea aurinia, Maniola justina* and *Papilio dardanus;* and the Scarlet Tiger moth, *Panaxia dominula*. Professor Ford naturally stresses his own research, but he has chosen *Drosophila* as an example of chromosome polymorphism, and snails to illustrate polymorphism and the development of the "supergene" (his term). The heterostyle-homostyle situation in primrose is the only extended discussion of plant material in the book, but this is only logical according to Ford since little is known about the ecological genetics of plants.

The limitations of space forbid a critical examination of the many excellent chapters in this book, but there are two concepts that form a continuous theme throughout the discussion. (1) "Unexpectedly great selective forces are normally operating to maintain or adjust the adaptations of organisms in natural conditions." It was originally thought that selective advantages of up to about 1 percent in wild populations was about normal. The present work on ecological genetics has shown that values of 20 to 30 percent are commonplace. This means that a population can rapidly readjust itself to changed conditions. Ford goes on to say, "the fact that such powerful selection is normally operating reduces to negligible limits the effects of random drift upon the changes in the frequency of widespread genetic qualities".

(2) Ford is skeptical of the importance of mutation in the evolutionary process. He sums up his position as follows. "Similarly, if ever it could have been thought that mutation is important in the control of evolution, it is impossible to think so now; for not only do we observe it to be so rare that it cannot compete with the forces of selection but we know that this must inevitably be so. One of the triumphs of Mendelism is the demonstration that there exists a system which promotes both great heritable variability and great heritable stability; for extremely permanent genes can be recombined in an infinite variety of ways and there are mechanisms, such as inversion and other devices for evolving close linkage, by which new combinations of value to the organism can be preserved." Ford admits that mutation is originally responsible for the diversity of the genetic units, but he goes on to say, "living organisms are the product of evolution *controlled* not by mutation but by powerful selection."

The above remarks are indeed a gross over-simplification of Professor Ford's elegant experimental studies of wild populations and his cogent analysis and interpretation of the results, but they do indicate the general trend of his conclusions.

The chapters on Mimicry, *Papilio dardanus* and the Evolution of Mimicry, and Transient Polymorphism and Industrial Melanism are among the best to be found anywhere. There are sixteen black and white plates of superior quality, a bibliography of slightly over 300 titles and an index—*Thomas W. Whitaker.*

PLANT PATENTS, WITH COMMON NAMES, 1963 SUPPLEMENT, 2208 THROUGH 2336. Published by the Amer. Assoc. of Nurserymen, 835 Southern Bldg., Washington, D. C. 20005. 1963. Pp. 7. $0.50. This is a supplement to the complete listing of plant patents, nos. 1 through 2207, 1931—1962. In the supplement, the subject matter is arranged under three parts: I. Numerical listings; II. alphabetical listings under common names; and III. alphabetical listings of names and addresses of originators or discoverers and assignees.

GENTIANS FOR YOUR GARDEN, by Doretta Klaber. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1964. Pp. 141. Illus. $4.50. Illustrated by the author, this pioneering book describes nearly one hundred gentian species and hybrids in the first part of the book. The second part is devoted to cultural directions for gentian culture, including also the available rare or difficult ones from the Himalayas, Japan, New Zealand, Europe and America. Highly recommended.

GARDENS OF ITALY, by Frances M. McGuire. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1964. Pp. 223. Illus. $4.95. This is an informal account of visits to some of the finest gardens of Italy, including the pertinent historical background. The subjects discussed include papal gardens, royal gardens, Roman gardens, water gardens, castle gardens, villa gardens, a Venetian garden, an island garden, lakeside gardens, and a botanical garden.

A HANDBOOK OF DRIED ARRANGEMENTS AND DECORATIONS, by Mabel Squires. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1964. Pp. 95. Illus. $3.25. This is an illustrated handbook for the beginner which presents an introduction to the drying of the vegetative parts of plants and the flowers, and their arrangement for decorative purposes. It explores containers, possibilities with decorative wood, treasures from the sea, natural forms, corn, dried materials for ornamental work, and household articles.

THE FLOWER ARRANGEMENT CALENDAR, 1965, by Helen Van Pelt Wilson. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1964. Paper with plastic ring binding. Illus. $1.50. The publisher sponsors an annual flower arrangement calendar contest. In this little book, the 19th edition, some of the outstanding photographs of floral arrangements accepted by the publisher are reproduced in calendar form for 1965. This calendar will interest those engaged in flower arranging.

CHEMOTAXONOMIE DER PFLANZEN. Band 2. Monocotyledonae (German), by R. Hegnauer. Birkhaeuser Verlag, Basel 10, Switzerland. 1963. Pp. 540. Illus. $ sFr. 98. This is a pioneering attempt to bring together the available information on the chemical composition of the monocotyledonous plants, and to correlate this data with relationships among the 48 families which are arranged alphabetically from *Agavaceae* to *Zingiberaceae*. It is not possible in a brief review to go into detail for the various families, and thus the *Amaryllidaceae* as arranged by Traub (1963) will be singled out as an example to show how the chemical data may be applied.

It is to be noted that typical alkaloids are characteristic of subfam. 4. *Amaryl-loideae*, and these substances are not reported for the other three subfamilies. In subfam. 1. *Alloideae*, the typical compounds are steroidsapogenins. In subfam. 2. *Hemerocalloideae*, only *Hosta* has been superficially investigated, and on that basis sapogenin has been reported. This is in harmony with the conclusions reached by Traub (1953) on morphological grounds that *Hosta* belongs with the *Agavaceae*. Thus only the genus *Hemerocallis* remains in Subfamily 2, *Hemerocalloideae*. Subfam. 3. *Ixioliriodeae* has not been investigated on a chemical basis, excepting for a brief reference to polyphenols in *Gagea lutea*. This is insufficient for any conclusions.

First, it has to be emphasized that chemical composition has to be considered in conjunction with data from other disciplines—embryology, anatomy, morphology, etc.—and thus conclusions from chemical data should be used with caution. However, on the basis of the evidence, it can be stated that there is a relatively great gap between subfamilies 1. *Alloideae* and subfam. 4. *Amaryllioideae*. Thus both could have originated from a common ancestral stock, but subfam. 4. has subsequently specialized in the type of alkaloids revealed at the present which are not present in Subfam. 1.

The chemical data reported, however incomplete, in the text are thus valuable to the worker in lineagics (the grouping of lineages; see Traub, 1964), and the book by Dr. Hegnauer should be in the library of every worker in that field.—*Hamilton P. Traub*

LITERATURE CITED

Traub, Hamilton P. The Tribes and Genera of the Agavaceae. Plant Life 9: 134—137. 1953.

Traub, Hamilton P. The Genera of Amaryllidaceae. 1963.

Traub, Hamilton P. Lineagics. 1964.

SEASIDE PLANTS OF THE WORLD, by Edwin A. Menninger. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Pp. 303. Illus. $9.95. This profusely illustrated encyclopedic guide to the planning, planting and maintaining of salt-resistant gardens, by an outstanding authority, will be welcomed by all who live by the sea. After a general statement about the problems presented to the seaside gardener, chapters are devoted to enemies, soil, windbreaks, planting, eroding hills and reclaiming marsh land, ground covers, vines, grass and lily-like plants, herbs, and sub-shrubs, shrubs, trees and palms, annuals, vegetables, lawns, and field crops. The appendix covers the subjects of salt tonerance in soils, sources of plant materials, and classification of salt-resistant plants to cold and the sea. Highly recommended.

THE PICTURE BOOK OF PERENNIALS, by Arno and Irene Nehrling. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Pp. 286. Illus. $5.95. Two outstanding horticulturists, a husband and wife team, have collaborated on this charming book. It is profusely illustrated, including some color plates. After explaining why perennials are their favorites, the perennials included are briefly described in an alphabetical arrangement. Next the planning and planting of the garden is explained, and finally, a calendar of operations, and lists of perennials for special purposes, are presented. Highly recommended.

THE CAMELLIA TREASURY, by Mrs. Paul Kincaid. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Pp. 224. Illus. $9.95. This profusely illustrated book by an outstanding authority will be welcomed by camellia growers. The subjects covered include camellias in the past, present and projections into the future, their use in the landscape, choosing varieties, planting and care, pest problems, greenhouse culture, Bonasi and other container growing, propagation, exhibiting at shows ,and use in arrangements. Highly recommended.

AN EASY GUIDE TO ARTIFICIAL LIGHT-GARDENING FOR PLEASURE AND PROFIT, by Vernon Johnston and Winifred Carriere. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Pp. 192. Illus. $4.50. Two authorities on the subject have collaborated to produce this book. After briefly describing the pleasure of light-gardening, the subject is developed in two parts: (1) the effect of light and darkness on plant growth; lamps and equipment; construction of the light-garden; designing the light-garden; care, and feeding of plants; propagation; profit from light-gardening; and (2) compatible light-garden plants. Recommended to amateurs interested in light-gardening.

MODERN ABSTRACT FLOWER ARRANGEMENTS, by Emma H. Cyphers. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Pp. 128. Illus. $4.95. The author, who is an authority, explores new possibilities in the field of abstract flower arrangements, explaining how to identify, evaluate and design such arrangements. The illustrations are excellent. Highly recommended to all interested in flower arrangements.

HOME AND GARDEN CALENDAR, 1965. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Paper, plastic ring binding. The publishers sponsor an annual Home and Garden Arrangements Calendar. In this little book, some of the outstanding photographs of such arrangements accepted by the publishers are reproduced in calendar form. It will appeal to those interested in home decoration.

FLOWERS AND FESTIVALS OF THE JEWISH YEAR, by Lillian S. Freehof, and Lottie C. Bandman. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Pp. 192. Illus. $5.95. This book fills the need of those who observe the festivals of the Jewish Year. It provides information on flower arrangements and table decorations for home, hotel, and synagogue or temple. The background of the festival days is detailed. The text is provided with excellent illustrations.

THE AFRICAN VIOLET CALENDAR, INCLUDING GLOXINIAS AND OTHER GESNERIADS, 1965. Hearthside Press, 118 E. 28th St., New York, N. Y. 10016. 1964. Paper, plastic ring binding. The publishers sponsor an annual African Violet arrangement Calendar Contest. In this little book, some of the outstanding photographs of such arrangements accepted by the publishers, are reproduced in calendar form. This calendar will appeal to those interested in African violets and related plants.

ADVANCES IN AGRONOMY, VOL. 16, edited by A. G. Norman. Academic Press, 111 5th Av., New York, N. Y. 10003. 1964. Pp. 414. Illus. This 16th volume of the series, including contributions from 18 outstanding authorities, represents a rich harvest with reviews on field plant physiology; crop response to "available" phosphorus; corn improvement; salinity in relation to irrigation; response of plants to soil compaction; nitrate accumulation in crops and nitrate poisoning in animals; soil oxygen conditions; population variability in relation to plant breeding; and amorphous inorganic materials in soils. Highly recommended.

PLANT LIFE LIBRARY—continued on page [ix].

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

I. THE AMERICAN AMARYLLIS SOCIETY

[A Committee of the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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The Chairman and Secretary of the Council also function as Official Instructors.
Examinations.—Those desiring to take the examination for the Official Amaryllis Judges Certificate, should preferably apply to the Official Instructor for details. See Plant Life Vol. 17, 1961, pages 30—34, for further details.

All accredited Amaryllis judges of the AMERICAN AMARYLLIS SOCIETY are members of the COUNCIL.

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3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Manila covers, 163 pages, incl. 8 illus. $5.00, postpaid.

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PLANT LIFE

AMARYLLIS
YEAR BOOK

1966

Amaryllis leopoldii

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EDITED BY

HAMILTON P. TRAUB

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ADDENDUM TO TRAUB'S "LINEAGICS"

Published in 1964

Change "Mauterpuis" to "Maupertuis": *Page* 18, lines 12 and 16; *Page* 35, middle of page; *Page* 36, lines 3 and 7 from bottom; *Page* 37, line 10; and *Page* 46, lines 2 and 12.

Page 60, after the second paragraph defining the term, *lineagics*, add:

For those who might have difficulty in pronouncing the term, *lineagics*, and variations thereof, it is suggested that the pronunciation is analagous to that of *genetics*:

the discipline:	the practitioner:
genetics (ge-net'-ics)	geneticist (ge-net'-i-cist)
lineagics (lin-e-ag'-ics)	lineagicist (lin-e-ag'-i-cist)

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NORTH AMERICAN SPECIES OF CREPIDOTUS, by L. R. Hesler and A. H. Smith. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1965. Pp. 168 + duplicate set of figures. Illus. $12.50. The purpose of this attractive text is to provide an adequate means for identifying the species of *Crepidotus*, a group of fungi which performs an important role in nature, that of reducing dead tops of trees back to humus. The text is presented on the basis of morphological and anatomical characters. Highly recommended.

MONOGRAPH ON THE GENUS GALERINA EARLE, by A. H. Smith and R. Singer. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1964. Pp. 357 + 20 plates. Illus. $23.50. This outstanding monograph on the genus *Galerina* places this group in its proper perspective in regard to other genera of the gill fungi, and elucidates evolutionary tendencies in the group. This information should be helpful in correlating future discoveries among these fungi. No less than 199 species of *Galerina* are described. Highly recommended.

A GARDENER'S BOOK OF PLANT NAMES, by A. W. Smith. Harper & Row, 49 E. 33rd St., New York, 16, N. Y. 1963. Pp. 428. $5.95. Sub-titled "A Handbook of the Meaning and Origins of Plant Names", this book is a worth while addition to the gardener's library. In the introductory section, the author briefly discusses the subject of plant classification and nomenclature. This is followed by (1) a list of botanical terms with definitions; (2) alphabetical list of plant names with meanings and origins: in each case the author indicates the root words in Greek and Latin together with the accepted definitions which derive from them, and the preferred English pronunciation; and (3) common name—scientific name index. Highly recommended.

CHEMOTAXONOMIE DER PFLANZEN, Band 3. Dicotyledonae. 1. Teil (from Acanthaceae to Cyrillaceae). (German), by R. Hegnauer. Birkaeuser Verlag, Basel 10, Switzerland. 1964. Pp. 743. Illus. 8 sh-r. 123. Volume 2 (Monocotyledonae) of this work was reviewed in the 1965 PLANT LIFE, and Volume 3 of the same work, concerned with Dicotyledones, 79 families from *Acanthaceae* to *Cyrillaceae*, is the subject of the present review. In the introduction, the grouping of the Dicotyledones according to Wettstein, Hutchinson and Takhtajan are considered, and the chemical characters of the Dicotyledones are discussed. The rest of the text is devoted to a detailed consideration of the chemical compounds found in the families from *Acanthaceae* to *Cyrillaceae*. This reference volume belongs in the library of every taxonomist.

TAXONOMIC BIOCHEMISTRY AND SEROLOGY, by Charles A. Leone (editor). Ronald Press, 15 E. 26th St., New York 10 N. Y. 1964. Pp. 728. Illus. $16.50. The forty-seven papers presented at the International Conference of Taxonomic Biochemistry, physiology and Serology in 1962, are included in this volume. The papers are grouped under seven headings: (1) principles of systematics, (2) perspectives in molecular taxonomy; (3) taxonomic biochemistry of plants, (4) taxonomic serology, (5) comparative biochemistry of animals; (6) taxonomic serology of animals, and (7) molecular taxonomy of microorganisms. This stimulating book is required reading for all taxonomists.

A HISTORY OF SCIENCE: HELLENISTIC SCIENCE & CULTURE IN THE LAST THREE CENTURIES B. C., by George Sarton. (Paperback reprint of the 1959 text): John Wiley & Son, 605 3rd Av., New York, N. Y. 10016. 1965. Pp. 554. Illus. $2.65. The publication of this fine paperback edition of Sarton's 1959 text, places this standard work on the history of western science and culture in the last three centuries B. C., within the reach of all biologists. Very highly recommended.

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PLANT LIFE. VOL. 22, NO. 1, January, 1966

AMARYLLIS
YEAR BOOK
1966

Year Book of
The American Amaryllis Society
32nd Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92038

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 129.]

PREFACE

In the 1965 issue, the extreme of irregularity in Amaryllis flower form—*Amaryllis cybister*—was featured on the cover. On the 1966 cover, the other extreme, the most regular Amaryllis flower form—*Amaryllis leopoldi*—is displayed; for which the members are greatly indebted to Prof. Penrith Goff, of the Modern Language Department, University of Kentucky, Lexington, Ky.

The 1966 issue is dedicated to Mr. Leon Boshoff-Mostert of Kleinskuur, Balfour, South Africa, who received the 1966 WILLIAM HERBERT MEDAL AWARD for his outstanding contributions in the fields of Amaryllis breeding and culture over the past two decades. Mr. Boshoff-Mostert contributed informative articles on Amaryllis breeding in past, and two reports on vegetative propagation of *Amaryllis* in the 1965 issue. In the present edition, he contributes an interesting autobiography, and Amaryllis reminiscences. For these contributions all of the members are grateful, and congratulate him on the receipt of the HERBERT MEDAL.

The Blossfelds of Brasil contribute brief biographical sketches; and Mr. Blossfeld writes of *Worsleya rayneri* in its native habitat.

In addition to the articles just indicated, Dr. Joseph C. Smith reports on a new dwarf *Amaryllis,* and also a new *Rhodophiala* species, collected by Dr. Rueppel in Argentina; Mr. Buck writes about additional *Amaryllis calyptrata* hybrids; Mrs. Herold on the rediscovery of *Amaryllis vittata;* Mr. Latapie on a new near-white double *Amaryllis;* Mr. Fesmire on breeding *Amaryllis* that bloom the year 'round; Mrs. Tebben on *Amaryllis* in Florida; Mr. Grubbs on *Amaryllis* in the Pacific Northwest; Mr. Schafer on *Amaryllis* in the North; Mr. Sudd on growing *Amaryllis* from seeds under artificial light; Dr. Corliss on germinating *Amaryllis* seeds in water; and Mr. Goedert on the 1964-1965 *Amaryllis* season.

Mr. Hannibal writes about *Crinum* clone 'Cecil Houdyshel'; *Crinum* clone 'Gulf Pride'; and the Santa Catarina Island *Crinum moorei;* Mr. Clouette on the growing of *Worsleya rayneri* from seeds; Mr. Beckwith D. Smith on growing amaryllis in North Florida; Dr. Jackson on cell division in *Haemanthus;* Mrs. Menninger on her *Nerine* breeding project; Mr. Gallagher on Nerines in England; Mr. Hannibal on *Nerine undulata;* Mr. Buck on *Hemerocallis;* Dr. Flory on the chromosomes of *Rauhia peruviana;* and Dr. Wilsenach on chromosomes of South African amaryllids.

Dr. Howard reports on his 1965 Mexican plant exploration trip; Mr. Authement explains the details for arranging Amaryllis exhibitions; Mrs. Pickard writes about judging Amaryllis; and there are reports on the 1965 Amaryllis shows.

There are descriptions of the new large white-flowering *Crinum brasilense;* and the new light primrose yellow *Crinum lutcolum.* And there are other contributions as shown by the table of contents.

Contributors to the 1967 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1966, in order to insure

earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated.

December 15, 1965,
5804 Camino de la Costa,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page (vi).

INTRODUCTION TO PALEOECOLOGY, by R. F. Hecker (English translation from the Russian), edited by M. K. Elias and R. C. Moore. American Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1965. Pp. 166. Illus. $7.50. This enlarged and updated edition of Dr. Hecker's outstanding text on paleoecology will be welcomed by American students and specialists in paleontology and geology. The topics discussed include (1) the history, objectives and methods of paleoecology; (2) field observations; (3) field collecting; (4) preparation of materials; (5) graphic illustrations; (6) photographic documentation of field observations; and (7) paleoecological exhibits. Highly recommended.

THE EVOLUTION OF BIOLOGY, by M. J. Sirks and Conway Zirkle. Ronald Press, 15 E. 26th St., New York 10, N. Y. 1964. Pp. 376. Illus. $6.00. The objective of the twelve chapters of this book is "to survey the developmental phases through which biology has passed" from prehistoric times, to the first civilizations, the Greco-Roman period, the Middle Ages, early and later Modern times and on up to the attempts to break the genetic code in our own day. This fascinating book is highly recommended.

PLANT ANATOMY, 2nd edition, by Katherine Esau. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1965. Pp. 767. Illus. $14.50. In this timely second edition of a standard text by an outstanding authority, the objective indicated in the first edition, to bring together "in a comprehensive form, the substance of a course in the anatomy of plants" is maintained. However, due to the great expansion of biological research, the revision is needed in recognition of "the change in emphasis and in the direction of interest." The topics discussed include the plant body, the protoplast, the cell wall, meristems and differentiation, apical meristems, vascular cambium, epidermis, parenchyma, collenchyma, sclerenchyma, xylem, phloem, secondary structures, the periderm, the stem, the leaf, the root, the flower, the fruit and the seed. This book belongs in the library of all interested in plants.

THE CYTOPLASM IN HEREDITY, by D. Wilkie. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1964. Pp. 115. Illus. $3.50. In this book by an outstanding authority, a concise account of the cytoplasmic factors in heredity are discussed. The author evaluates the evidence from biochemistry, cytology and genetics for the functioning of genetic systems outside the chromosomal apparatus, particularly the cellular organelles. This stimulating book belongs in the library of every biologist.

A HISTORY OF SCIENCE; ANCIENT SCIENCE THROUGH THE GOLDEN AGE OF GREECE, by George Sarton. (Paperback reprint of the 1952 text); John Wiley & Sons, 605 3rd Av. New York, N. Y. 10016. 1964. Pp. 646. Illus. $2.65. The appearance of this excellent paperback edition of Sarton's 1952 text, places this standard work on the early history of western science through the 4th century B. C. within reach of all biologists. Very highly recommended.

PLANT LIFE LIBRARY—continued on page 24.

DEDICATED TO
LEONARD HELDENMOED BOSHOFF MOSTERT

TRAUB—AMARYLLID NOTES, 1966, continued from page 62.

Urceolina urceolata var. *fulva* (Herb.) Traub, *comb. nov.* Syn.—*Urceolina fulva* Herb., Amaryll. 194. 1837; *Urceolina pendula* var. *fulva* (Herb.) Bak., Amaryll. 109. 1888.

Raubia megistophyla (Kraenzl.) Traub, *comb. nov.* Syn.—*Phaedranassa megistophylla* Kraenzl., in Engl. Bot. Jahrb. 54, Beibl. 17: 2—3. 1916; Plant Life 21: 101. 1965; *Raubia peruviana* Traub, Plant Life 13: 73—75. 1957.

Notes.—Herbert, in Amaryll. 1837, *numbered* the genera which he accepted (see "Introduction" to facsimile 1966 Reprint, Herbert's "Amaryllidaceae", 1837). The generic name, "Callithauma? Herb.", Amaryll. 225. 1837, "not sufficiently known to enable a perfect generic character", was not numbered, and was thus not accepted by him as of that date (Code, Art. 34-1). Under it he listed "Callithauma? viridiflorum Herb." Amaryll. 225. 1837, based on *Pancratium viridiflorum* R. & P., with the notation that "It is barely possible that it may be an *Ismene*, but very improbable." This was later recognized as the type of a validated *Callithauma* Herb. Herbert also listed "Callithauma? spathulatum Herb." Amaryll. 225. 1837, with the notation, "It is probably of a separate genus." Of this he had seen only the bulb and leaves (no specimens preserved), and he could make only a guess (incorrect) as to the flowers; thus listing it in anticipation of its future acceptance as a group, and also of a particular circumscription and rank (Code, Art. 34-2). Thus it was not validly published. *Phaedranassa megistophylla Kraenzl.* (1916) was the first description based on the bulb, leaves and flowers of a plant with similar leaves, and this is the validly published epithet of the species.

EMEND. ET CORRIG.

"Genus *Lepidopharynx* Rusby" and "*L. deflexa* Rusby" in Mem. N. Y. Bot. Gard. 7: 214—216 (*pessime*), Fig. 1 (*pessime*). 1927, are hereby reduced to *Amaryllis* L. 1753, and *A. cybister* (Herb.) T. & U., respectively (see Traub, Gen. Amaryll. 77. 1963).

Rusby's description and figure were based on a distorted conception of *A. cybister*, particularly (a) the shape and disposition of the tepalsegs, and (b) the stamens and style. The former should have been indicated as quite irregular (zygomorphic), and the latter as fascisculate, declinate-ascending.

HERBERT MEDALIST—LEONARD HELDENMOED BOSHOFF-MOSTERT

LEONARD HELDENMOED BOSHOFF-MOSTERT

AN AUTOBIOGRAPHY

My interests in life have always been and, to some extent, still are many and varied. In the field of sport, athletics and rugby gave way to golf and, ultimately, this game was ousted by the first sport and recreation which has been entrenched since my childhood—angling. I still take part in all facets of angling and regularly represent my Province in the annual South African Angling Championships. It was, however, in deep sea game-fishing that, in 1962, I was elected to the three-man team to represent South Africa at the International Contest at the Bahamas. As a dog breeder, I can boast of a few South African Champions and my name appears on the South African Kennel Union's schedule of accredited S. A. Championship judges. I am Past President of the Transvaal Anglers Union, Honorary Life Member of the Witwatersrand Kennel Union, of the Iscor Recreation and Social Club of which I was a founder and of the Iris Society of Southern Africa of which I was also a founder and first Secretary. In the cultural sphere, I am the holder of seven medals for elocution and a couple for singing —all awarded in open competition at our National Eistedfodd. As far as civic honours are concerned, these were not earned, but purely fortuitous, when I was awarded the Honorary Citizenship of New Orleans and also the Keys of the Cities of Corpus Christi (Texas) and Sacramento (California).

But of all I have ever realized, including the thrill at the sight of a new break amongst a batch of *Amaryllis* seedlings coming into bloom, the crowning glory of my life was the news that I had been awarded the William Herbert Medal for 1966.

It was under the British flag, during the reign of Edward VII, that I first saw the light of day. The date was December 28, 1909, seven-and-a-half years after the conclusion of the Anglo-Boer war and five months before self-government was granted to the four Provinces at the tip of South Africa, then under British rule. The place of my birth was the farm Manana in the district of Lichtenburg, at the time still a small rural town in the Western region of Transvaal, which is the most Northern of the four Provinces of the Republic of South Africa.

Little could anyone have known that, as a toddler, I played and romped with bare feet on ground which, within two decades, was to become a segment of the world's most fabulous alluvial diamond digging complex. Even less could I have dreamed that, seventeen years later, as a school champion miler, I would run in seven of the many diamond rushes, in one of which, with burning chest and aching limbs, I found myself in the company of international athletes imported to lead a field of just over 27,000 exhausted peg-bearing runners.

I was the third son to be born to a young couple, barely four years previously wedded. My eldest brother, who holds a high executive post

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in Barclays Bank, was named after my paternal grandfather, whilst the middle brother, one of South Africa's leading poultry breeders, was given the name of my maternal grand-father. There being no more grand-fathers to honour, I was named for a stranger held in high esteem by my father, but whom I have never met. He was a Hollander, not even naturalized, who fought against Britain in then the costliest of all her wars, on the side of a hand-full of unprepared and ill-equipped Boers. This man shared a tent with my father during their enforced furlough as prisoners of war in Burmuda. His name was Leonard Heldenmoed and, although I have been called Leon from my babyhood, those are the names that my parents caused to be inscribed on my baptismal certificate. I have often wondered whether, in naming me thus, the deep affection towards a friend was tempered with a father's challenge to his last born, for the names imply "Heart of a Lion" and "Courage of a Hero". I am proud of the names and their origin, but I regretfully have to admit that I cannot lay claim to either of the qualities they convey!

My father was a school teacher who successfully devoted as much time and energy to his manifold gardening activities, as to his academic profession. Wherever we lived, the Boshoff garden, in which we all had a share, was always an object of family pride and a subject of envy on the part of neighbours. My mother was a woman of high intellect and dynamic personality with a forceful and ambitious character and was known throughout our country. She was an authoress and a writer for several newspapers and journals. As a leader of her sex, she served on executive committees, often as chairwoman or secretary, of various charitable, church, political and other commendable women's organisations. Even at the time of her death in 1954, after a widowhood of ten years, she held office as Honorary President of the Women's Nationalist Party of the Witwatersrand.

Four years before I finished high school, thought had to be given to the provision for University training of three sons, a somewhat futile endeavour on the salary of a primary school teacher. My father, with a view to better financial prospects, decided to retire from teaching and to commute his pension in order to start up a coal business. In this he was encouraged by his wife and three sons, none of whom, no more than he, was aware of his lack of business acumen. The undertaking was a failure.

In my final examinations, my school led the field in the Transvaal with four first class matriculation passes. University for me, however, in spite of my scholastic success and the offer of three minor burseries, was not to be. After leaving school at the age of seventeen, I embarked upon a banking career in 1927 in the footsteps of my two brothers.

In 1932, after not having seen or heard of each other for five years, I met an erstwhile school friend. During our school years we had nothing in common, other than that we were of the same age and in the same form where she was regularly first in the girls' class, whilst I invariably maintained a similar position in the boys' class. She was

then reading medicine at the University of the Witwatersrand in Johannesburg, where I worked in the Bank.

Her father, the late A. M. Mostert, was a farmer in the corn belt on a 19,000 acre estate, a few miles from the little town of Balfour which is situated 50 miles South-East of Johannesburg. I was often invited to spend week-ends on the farm and Frieda and I soon found that we had so much in common that we decided to become formally engaged. Among his many financial and industrial interests, such as being on the South African Board of Directors of Barclays Bank, Mr. Mostert was also Vice-Chairman of ISCOR (South African Iron and Steel Corporation), then in the course of erection at Pretoria, the administrative Capital of South Africa.

Frieda Mostert, the fourth of a family of seven children, sacrificed her medical career and we were married in May, 1933. I then resigned from the Bank in spite of rapid advancement and a promising future, to fill a "ground-floor" post at ISCOR as personal assistant to the first General Manager, at the age of twenty-three-and-a-half years. The commercial experience gained in the Bank, combined with the knowledge acquired through my studies to pass my Bankers' examinations, stood me in good stead in the new job. In addition, I was a proficient shorthand-typist, having attended night classes at the Johannesburg Business College for that training, after passing the final Bankers' examination. During my years at ISCOR, where I had the advantage of being one of the "early starters", I held various senior posts, including that of Assistant Secretary.

My wife's father died in 1939 and in his will left us a portion of his estate, measuring about 2,500 acres. Provision was made for the erection of a suitable home for us on our portion which we have named "Kleinskuur", meaning "Small Barn". We were left a modest but secure cash income for life. Provision was also made for all costs involved in the high school and university education, including overseas studies, for our children of whom there are three. Magda was born in 1934, Ida in 1936 and our son Andries in 1940. The girls are both married and we are the proud grand-parents of five girls and four boys.

Mr. Mostert stipulated in his will that we had to occupy the farm left to us "permanently and beneficially" within a specified period, which entailed my abandoning yet another promising career. I gladly and proudly reacted to his wish, legally to assume his name, which was added to my own as a suffix. This I interpreted as a singular compliment coming from one of South Africa's great men. At the end of 1940 I left ISCOR and we settled on the farm.

During the ensuing year and the few years following, all manner of war-time legislation, emergency measures and control regulations came off the government press in regular flow. The Chairman of ISCOR, the late Dr. H. J. van der Byl, was appointed Director-General of Supplies and strict measures of control were instituted over all industries and essential commodities, strategic as well as civilian. At the instance of Dr. van der Byl, the "permanent occupancy" clause of the will was

waived and I was temporarily recalled to service in Johannesburg in February, 1942 to assist in the establishment of the Iron and Steel control office, on the understanding that I would be released towards the end of that year. For nine years, apart from an occasional vacation, I was to see my family only during week-ends.

As the months rolled on, I became progressively more involved in the ramifications of the Supplies Organisation and it soon became evident that my commission was developing into anything but a "temporary expedient", as was originally envisaged. As regards Kleinskuur, suitable arrangements were made, under the able direction of my wife, for two farmers to work the land on a share basis, whilst she personally took charge of our herd of Aberdeen Angus cattle and the many farming side-lines. In addition to those multiple responsibilities, my wife found time and energy to add to the nucleus of her imported *Iris* collection which, within the following ten years, developed into not only the first, but also the largest commercial undertaking of its kind in the country. At the same time, she built up a substantial collection of *Hemerocallis*.

Meanwhile, I had interested myself actively, whenever time permitted, in my wife's horticultural endeavours. The sight of about a thousand different named varieties of imported *Iris* in bloom was an impelling inspiration. I required little, if any, encouragement to take part, under her guidance, in my wife's annual "operation pollination". I made time, even by artificial light in the evenings, to prepare seedpans and to plant seeds as they matured. It was, indeed, a proud day when my own creative efforts, some years later, unfolded the beauty of their first blooms.

Whilst during week-ends and the odd spell of vacation, I was thus paving my way towards an ultimate partnership in my wife's *Iris* and *Hemerocallis* nursery, I lost my heart to *Amaryllis*, of which my mother-in-law had a small but attractive collection. She gave me some clones which I cherished, nurtured and admired above all flowers. I obstinately closed my ears to the persistent little voice of conscience reproving me for my divided loyalty. There was, however, no rebuke forthcoming from my *Iris* breeding wife and *Amaryllis* tenaciously prevailed over conscience!

Fate played into my hands in 1947 when my wife received an order for her newest and best *Iris* from the late Mr. A. C. Buller of Stellenbosch in the Cape, then generously acknowledged as the *Amaryllis* King of South Africa. His cheque was returned and in lieu of payment for the *Iris*, my wife arranged with Mr. Buller to send her some *Amaryllis*, a substantial parcel of which arrived in August of the following year. This was the first of many consignments, of what Mr. Buller termed the cream of his collection, to come to Kleinskuur.

Reams can be written on the close association that subsequently developed between Mr. Buller and myself, on our reciprocal visits to each other over a distance of almost a thousand miles and on the knowledge I gained through his instruction. His wish was that I should

carry on with the breeding of *Amaryllis* where he had decided to retire, after having worked on the Buller strain over a span of fifty years. My own breeding efforts started with my first crosses in 1948.

By the end of 1950, when I was finally released from the Supplies Organisation to join my family, I had held office at one time or other, as Controller of Iron and Steel, Secretary of the Controllers' Executive Committee (the co-ordinating body of the 16 Commodity Controllers), Secretary of the Board of Supply (which formulated policy), Member of the Cabinet Building Advisory Council, Assistant Secretary to the Director-General of Supplies, Assistant Director of Imports and Exports, and Secretary to the American Lend-Lease Mission during its stay in South Africa for final settlement of accounts.

When the news of my retirement became known, I had various offers of attractive and lucrative posts. I succumbed to temptation and accepted one of these offers, being a directorship at a salary of 50% higher than that which applied to the post I relinquished. In the new office, I had infinitely more time and freedom to devote to the development and improvement of my *Amaryllis* collection which grew to such proportions that, by the end of 1954, it demanded my undivided attention. It was then that I finally came to Kleinskuur, permanently to join forces with my wife. Our son who studied agriculture, with a brilliant College record, later became the third member of the Kleinskuur team and has taken charge of the general farming operations, which he manages most adequately and efficiently.

With gratitude and humility I must record that my wife, who knows more about my *Amaryllis* than I do about her *Iris* and *Hemerocallis*, has been my inspiration in all that I have ever achieved. But this notwithstanding, I want to believe that, by my own efforts in some measure, I have done justice to the confidence which Mr. Buller had placed in me and, more important still, to the great honour bestowed upon me by the Board of Directors of the American Plant Life Society.

THE BLOSSFELDS

Biographical sketches

On request of Dr. Hamilton P. Traub, I am submitting a short report on our life and work in South America, to the readers of the Amaryllis Year Book.

Born in 1913 in Potsdam, Germany, the writer is descended from a horticultural family; both his grandfathers were growers and his father was an orchid specialist before he started his seed business. He introduced, among others, *Kalanchoe blossfeldiana*. After my horticultural apprenticeship, I entered the Botanical Institute of Berlin-Dahlem as a student of botany. After a few years, I interrupted studies for a planned six-months expedition to South America. Seven months

Fig. 2. Harry Blossfeld in 1964

were spent in the Andes Mountains of Argentina, mostly in search of cacti. The plants shipped back proved very valuable—many new species were among them—so that funds were offered from private col-

Fig. 3. Mrs. Anita Blossfeld

Engaged in field work near Sao Paulo, Brasil, she holds a bouquet of **Neomarica caerulea.**

lectors and commercial growers, for more material. A year was spent in Bolivia, Peru and Chile and a third collecting trip led through Uruguay, Paraguay and Brazil.

Since my return to Germany seemed unadvisable due to the imminence of war, and having contracts for collecting orchids in Brasil, I decided to establish myself as a plantsman in São Paulo, Brasil, where I have lived for the past 27 years.

Here I met my wife, Mrs. Anita Blossfeld. Her family came from the Baltic States. My father-in-law had been a collector of medicinal herbs in the Caucasus, so that my wife got her inclination for botany early in life. We started collecting orchid species and grew them for sale to local amateurs. Most of the money earned was spent in collecting trips; we never had any official subsidy, though we sold and exchanged plants and seeds with many official institutions all over the world. Besides orchids, we always brought home from our travels, many other plants, including Gesneriads, Bromeliads, Begonias and Amaryllids.

After my last trip through Peru, Ecuador and Colombia, I returned seriously ill and have suffered from bad health for about twenty years. Forced to stay home, I started writing for Brasilian agricultural periodicals, and I also wrote a few books on horticulture. My wife began to make trips and made several large and very successful plant collecting trips to Argentina, Peru, Bolivia, Ecuador and Columbia. She developed a special interest in Aroids and brought home a fine assortment of *Philodendron* and *Anthurium* species. For her collecting work, she was awarded the Sesquicentennial Silver Medal of the Rio de Janeiro Botanical Garden.

With regard to *Amaryllis*, my first field contact was during my work in northern Argentina, where I discovered a wild colony of *Amaryllis immaculata* and shipped a consignment of the bulbs to Holland. This species had disappeared from cultivation. During our collecting trips in Brazil, both my wife and I have gathered a number of species, including *Amaryllis aulica*, *A. psittacina*, *A. calyptrata*, *A. striata* and its varieties, *A. morelinana* and *A. reticulata*. We distributed seeds of these, until a severe freeze and a caterpillar pest (*Xanthopastis timais* Kr.) eliminated our stock. We also localized a colony of *Worsleya rayneri* in the Organ Mountains and have been distributing seeds of this species which is the famous and rare "Blue Amaryllis". Some observations on this subject will follow.

Harry Blossfeld

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NOTES ON WORSLEYA

HARRY BLOSSFELD, *Tremembé, São Paulo, Brasil*

HISTORY—The famous "Blue Amaryllis" was discovered by the French horticultural collector Joseph Libon, in the Organ Mountains, west of Rio de Janeiro, Brasil, about a hundred years ago. Libon was pretty sure that he had found a new plant and showed it to Glaziou, director of the National Museum, who sent herbarium material to France.

Tradition is, that Glaziou also arranged an audience for Libon, with her majesty, the Empress of Brasil, at which opportunity the collector offered a few freshly gathered flower stems of the "Blue Amaryllis". The plant, from that time on, became known in Brazil by the popular name "Flor da Imperatriz".

A little later, 1863, the new plant also got its first scientific name from the french botanist Duchartre: *Amaryllis gigantea Duch.* Though certainly an appropriate name for an *Amaryllis* five feet high with bulbs up to ten pounds in weight, it proved to be void, because another plant, which we now know as *Brunsvigia Josephine* Ker Gawl. had previously been described by it. The author himself recognized this fact and in the same year, changed the name of the "Blue Amaryllis" to *Amaryllis procera* Duch.

Libon had shipped a consignment of these bulbs to his patrons, the horticultural establishment of De Jonghe, of Brussels, Belgium, who showed the first flowering specimens at a horticultural exhibition, creating quite a sensation at that time. More plants were ordered, but Joseph Libon had perished in the jungles of Minas Gerais, during an orchid collecting trip. The "Blue Amaryllis" had been one of his last discoveries, and certainly not the least. As early collectors generally did, Libon had kept secret the place where he had found the plant and consequently, it disappeared from cultivation for some time.

It was found again by Pedro Maria Binet, a horticulturist established in Brazil. On each of his numerous travels to Europe, he carried a few bulbs of the "Amaryllis Imperatrice du Brésil" with him, selling them at fancy prices in France or Belgium. But always these bulbs flowered but once and then dwindled away, no matter how careful the treatment given to them. They were treated as other *Amaryllis* and forced to compete dormancy in winter in spite of the fact that the species is naturally evergreen. Trials to cross it with other *Amaryllis* species failed, and thus the plant remained a rare curiosity for a long time.

On a botanical excursion through the Organ Mountains, the writer and his wife met with the "Blue Amaryllis" and we gathered bulbs and seeds. Also we have grown about one hundred bulbs in our garden for a few years and thus had the opportunity of observing them. We have visited the natural stands frequently and at various seasons of the year Some facts that seem to have escaped previous students will be exposed here.

Fig. 4. **Worsleya rayneri** in its native habitat—the Organ Mountains in Brasil. Left, natural stand, with immature seed pods on flattened scapes. In the foreground, a dwarf **Vellozia** shrub. Right, Natural stand as it grows in the Organ Mountains. Note the steepness of the rocky ground and the prevailing fog during the morning hours when this photo was taken.

HABITAT CONDITIONS.—Worsleya rayneri (Hook.) Traub & Moldenke grows within the tropic belt, but at elevations between 3000 and 4000 feet above sea level. (Fig. 4) The latter fact reduces considerably the theoretical average temperature for the habitat in that latitude. On the other side, it causes the plant to be exposed to accentuated extremes of heat, during exposure to intense sun rays, and of cold, due to heat radiation by night and exposure to cold winds. During some of the coldest nights of our mid-winter (July) temperature may approach the freezing point.

The plants grow on almost bare rocks, that have an inclination of about 30 to the horizon, sometimes up to 60, facing a northern direction, that is in the Southern Hemisphere, fully exposed to the sun. They do not receive shade from other vegetation, which is extremely scant. But they are cooled by an incessant air movement at their lofty place. Where this is lacking, the plants will require some shade.

Worsleya grows in patches, sometimes of several dozen specimens in a dense stand, but mostly in narrow rows in a natural crevice of the granite boulders that otherwise have very smooth surfaces. The summits of these enormous rocks are mostly clad with a crown of trees and shrubs that act as condensers of the air humidity. The accumulated vegetable mould of this forest patch therefore oozes out a little water that trickles over the rock surface below, drenching the *Worsleya* roots. During heavy rains, some soil and dead leaves are washed down and accumulate along the rows of the bulbs, thus creating a turfy soil layer, sometimes ten inches thick. On these, seeds of *Worsleya* germinate and form increasing clusters of plants.

On sunny days, the water supply from above stops and the rock surface during the afternoon gets so hot, that one cannot touch it; the air trembles and the rock steams. Even during the night, the accumulated heat radiates from below, so that the *Worsleya* roots stay always moist and warm, even while their leaves may be exposed to temperatures between 40 and 50 F.

Such extreme conditions of heat and cold, scorching sun and water-soaked soil, cannot be endured by many plants. Companions are few and odd; A small terrestial orchid with cinnabar red flowers, *Laelia cinnabarina* Batem. with narrow, succulent bulbs and thick perpendicular leaves, and another rare orchid, *Phragmopedilum vittatum* Rolfe, are noteworthy, A. Vellozia species with triangular stems and narrow leaves arranged in vertical rows, thus shading mutually, is rather common. A giant Bromeliad, *Vriesia imperialis* Carr. withstands the conditions because it has a proper cooling system; it stores five gallons of water between its sheathing leaves, which are covered by a glaucous wax coat above. The *Worsleya* leaves withstand the fierce sun, because they hang vertically and they too have a pruinous wax cover. On limbs of the forest trees on the top of the stone mountains, and epiphythical cactus is found: *Schlumbergera Russelliana* (Lam.) Br. & R. All these mentioned companion plants are considered by botanists as outsiders within their respective families or remnants of primitive evolutionary

stages. To such strange plants, *Worsleya* is a worthy companion, a sort of "living fossil" of the Amaryllis family, unique in some respects.

TAXONOMY.—as above mentioned, the "Blue Amaryllis" was first named *Amaryllis gigantea Duchartre*, soon changed to *Amaryllis procera Duchartre*. But this name too could not be maintained, because there existed a plant previously named so by Salisbury; this is now known as *Crinum erubescens* Ait. The next following description of the "Blue Amaryllis" appeared in 1771 when J. D. Hooker named it *Amaryllis rayneri* J. D. Hook. In 1943, Traub and Moldenke created a new genus to accommodate this plant, separating it from the genus *Amaryllis*. Hence its name became *Worsleya rayneri* (J. D. Hook) Traub & Moldenke.

The reasons for the establishment of a new genus "*Worsleya*" were as follows:

(a) The existence of four spathe-valves enveloping the flower buds of *Worsleya*, while all *Amaryllis* have only two spathe-valves; (b) Seeds D-shaped, with unequal thickness of inner (straight) and outer (curved) edges; (c) Gestation period relatively long—up to five months, and (d) Leaves sickle-shaped.

And to these should now be added the fact that *Worsleya* has a basic chromosome number of X=21 (somatic 2n=42) as contrasted with a basic number of X=11 (somatic numbers 2n=22, 44, 66) in *Amaryllis* L. (see Flory & Schmidhauser, Plant Life 19: 56057. 1963.)

DISCUSSION.—(1) Spathe valves four. This argument is unquestionably valid, it has been interpreted as evidence of a primitive stage of evolution.

(2) "Seeds D-shaped, the inner edge 0.5mm thick, the outer about 1 mm thick, somewhat sunken and wrinkled between the margins and the side walls."—This argument is equally valid, but may be extended.

Fig. 5 (1) shows a fully ripe pod of *Worsleya rayneri* seen from the side. Fig. 5 (2) and Fig. 5 (3) show the form of the seed. At "C" is visible the reinforced, wrinkled dorsal wall. Fig 5 (3) shows a cut through a normal seed, showing that the embryo occupies practically the whole volume of the seed. This is an important criterion since most other Amaryllid seeds have a small embryo surrounded by a large, sometimes almost hyaline or papery wing. Fig. 5 (5) shows a *Worsleya* pod, seen from above, fully ripe, but still closed. At "D" are the points where it will start splitting. The three locules contain each two dense rows of closely packed, rather thick seeds, forced to shape into the typical D-form because they will not interpenetrate the divisionary line of their sector. Attention is called to the thick, fleshy walls of the pod.

When by imperfect fertilization, only few seeds are developed in a *Worsleya* locule, these sometimes occupy the whole space of the locule and then become perfectly orbicular. Also the uppermost and lowermost seed of each locule have a partial orbicular form, one side convex and the opposite side plane.

For comparison, in Fig. 5 (6) is shown a pod of *Amaryllis aulica* Ker Gawler shortly before ripeness. At "D" are the points where it will

split. The seeds of each locule here are equally set in two rows, but they have papery thin wings which overlap mutually. This can happen, because the embryos occupy only the center. In most *Amaryllis* pods, seeds therefore have an oval or oblong shape. Attention is called to the thin walls of the typical *Amaryllis* pod.

(3) "Gestation period relatively long, up to five months." The above observation certainly has been made under conditions of the Northern Temperate Zone, but will not yet come true in the tropics. Normal gestation period of *Worsleya* is about ten weeks. The writer has observed in Brasil, an almost perfect coincidence of flowering and seed ripening between *Worsleya rayneri* and *Amaryllis aulica*. But there is a decided difference between the two genera in the delay normally occurring before the pods empty all the seed they contain. Due to the thick walls of the capsule, as shown in Fig. 5 (5), and owing to a strong reinforcement of the bottom, shown in Fig. 5 (1) at "A", *Worsleya* pods open slowly and only to an angle of 30°. This delays dropping out of the seeds. In nature, they are mostly withdrawn by birds. When the *Worsleya* pod cracks, all its seeds are already perfectly ripe and jet black, but it may take two months, before the pod is empty.

As shown in Fig. 5 (6), the foliaceous seeded *Amaryllis* species have pods with thin walls which become quietly and completely dry on ripening. The locules then rapidly fold back to an angle of 90°, exposing the winged seed to the wind. As they are interleaved, each seed detached is likely to unfasten its opposite neighbor, so that the process of emptying a pod is a matter of a few days only.

Worsleya seeds are much too heavy for wind dispersal. Their average weight is about 7.5 grams per hundred, so that approximately 400 seeds weigh one ounce. A large part of the seeds simply drop out of the pods by gravity, but the lower parts of the rocks, where they finally might germinate, is clad with dense vegetation, so that *Worsleya* has very little chance of survival there.

A small sort of parrot, that lives in bands, can frequently be observed withdrawing *Worsleya* seeds from the ripe pods. On the least disturbance, the whole band bursts upon wing, each bird carrying a seed in its beak, which is eventually dropped during the flight. This fact explains, how *Worsleya* may grow high up on the cliffs, where they are completely out of reach, clustering at quite inaccessible spots.

(4) "Bulbs with an extremely long aerial neck." This feature is conspicious in *Worsleya;* some of the largest specimens are five feet high, of which three feet belong to the neck. As to the taxonomic importance, the matter is of subordinate value, because it refers to the vegetative organs of the plant and not to its reproductive parts. It may be mentioned, that *Crinum Moorei* Hook. f. has an equally conspicuous long aerial neck and nobody would think of separating it for that from its genus. However, when taken in connection with the other features, it helps to characterize the genus.

(5) "Leaves sickle-shaped". This again is a fine distinguishing feature of *Worsleya*, unique in the whole family, but for the reasons above mentioned, its taxonomic value is of a collateral order. It may

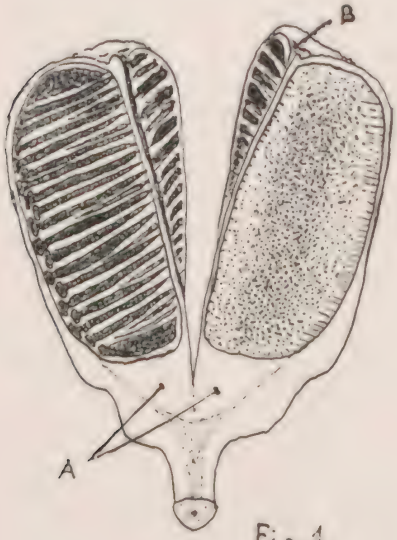

Fig. 1

Fig. 2

Fig. 3

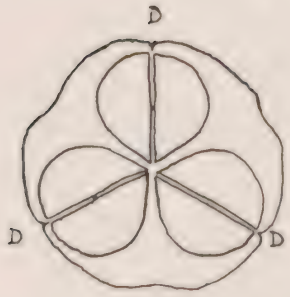

Fig. 5

Fig. 4

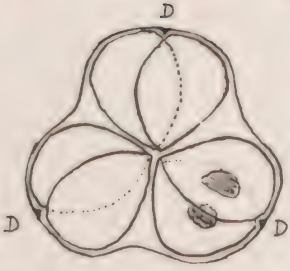

Fig. 6

Fig. 5. Worsleya rayneri capsule and seeds. See text for explanations.

be added, that by the normally inclined position of the aerial neck of *Worsleya* bulbs and by the sickle-shape of their leaves, the blades are kept in a vertical position throughout their length, which is an efficient

Fig. 6. The Blue Amaryllis, **Worsleya rayneri**, in flower. Left, in the Organ Mountains, Brasil. Right, under cultivation in the Blossfeld garden in Sao Paulo, Brasil.

protection against sun-burn. Furthermore, the blades have a narrow, cartilaginous border of brownish red color. They are distinctly parallel nerved by alternating lines of light and darker green and they are covered by a glaucous wax cover that repels water.

(6) The basic chromosome number X=21 in *Worsleya* sets it off distinctly from *Amaryllis* with a basic number of X=11.

As an uncommon occurrence within the Amaryllis Family should be noted, that the *Worsleya* perigone is dehiscent. While in all of the foliaceous seeded *Amaryllis* species, one can find the dried remains of their perigone attached to the unripe pod during its complete gestation period, the matter is different with *Worsleya*. There, a few days after the flower is wilted, it drops from the still small pod, leaving a big brown scar in form of a three-pointed star at top of it. When the pod becomes ripe and starts to crack, this scar tissue detaches and separates in the form of an extremely thin, papery tissue, from the three points of which hang short, fibrous sutures which had soldered the fruit valves. This triangular tissue is shown in Fig. 5 (4). It has a small, round hole in the center, through which formerly the style was connected to the ovary.

Another significant fact is the longevity of *Worsleya* seeds. Under ordinary storage conditions, this seed will keep its germinating capacity for over one year. This is extraordinary, when compared with the notoriously short lived seeds of the foliaceous seeded *Amaryllis*.

The peduncle that sustains the umbel of flowers in *Worsleya* is flat and sharply two-edged. It is *hollow* in its central part and grows almost straight, while the leaves are curved. Thus, the flowers open well above the foliage, though it is rarely possible to cut these flowers with a stem longer than 12". The peduncle will continue growing longer while the pods are developing. Strong plants develop two or even three peduncles, but the rule is one flower stem per bulb. The umbels are reported to consist of 4 to 14 flowers, but we did not count more than 8 flowers per stem, the average being 4.

Worsleya seems not to be happy when grown in pots. The bulbs have a spreading system of very thick roots that are easily broken. The plants always suffer when transplanted. Grown in large, flat containers, they do somewhat better and best of all, when grown in the open ground.

The plant requires perfect drainage, a porous soil and a very regular supply of moisture. Also they want an abundance of light and as much direct sun as can be allowed without burning the leaves. It seems that the best results were obtained by a grower who used a standarized soil mixture, composed of equal parts, by volume, of fibrous peat and fat, sticky loam.

Under no circumstances, should *Worsleya* be forced to dormancy after blooming. Though slowly, the plant will continue growing new leaves during winter, when temperatures may be rather low. Water should be given scantily but regularly during this season.

IN MEMORIAM—LEN WOELFLE

T. M. Howard

It is with great sadness that I must inform members of the Society of the passing of Len Woelfle, of Cincinnati, Ohio, who was well known for his work with *Hymenocallis* and other Amaryllids. Mr. Woelfle was born July 18, 1913 and died quite suddenly at his home on August 24, 1964, from a heart attack. His death was a shock to all who knew and loved him. He had been in good health seemingly until his final moments, having just finished mowing the lawn. Mr. Woelfle will long be remembered for his breeding program involving *Hymenocallis*. His hybrids are only now being channeled into the hands of enthusiasts and have been enthusiastically accepted by the few who have flowered them. An effort will be made to propagate his material and place it into commercial channels where it can be enjoyed by all. Mr. Woelfle will be sorely missed. He was a fine person, full of optimism and enthusiasm, and had a genuine love for his fellow man. It is hoped that his efforts to radiate enthusiasm for the plants that he loved will be absorbed by others and that his work will continue. Mr. Woelfle was Chairman of the Pancratieae Section of the APLS and had been active in Round Robins as well.

EDITOR'S MAIL BAG

Miss Elizabeth Lawrence, 348 Ridgewood Ave., Charlotte, North Carolina 28209, and Mrs. Richard Chase, 4563 Contour Blvd., San Diego, Calif., visited the editor's garden on March 25, 1965.

The members will be saddened to hear that Mrs. A. C. Pickard's husband, Dr. Alpha C. Pickard, aged 68, a renowned physician of Houston, Texas, died of a heart attack, on May 27, 1965. He was a keen gardener, and his wife's co-worker in the breeding and growing of hybrid *Amaryllis*.

Mr. and Mrs. L. S. Hannibal, Fair Oaks, Calif., visited the editor's garden on June 1, 1965.

Mr. Robert D. Goedert, of Jacksonville, Florida, writes under date of July 2, 1965, that he obtained *Amaryllis cybister spectabilis* from Brasil just in time since a dam will flood the area where they grow in Matto Grosso in the next few years.

Mr. V. Roger Fesmire, formerly of Denver, Colorado, has moved to California. His new address is 16938 Edgar St., Torrence, Calif. 90504.

Mr. Kenneth A. MacGowan, of Quincy, Florida, writes under date of June 18, 1965, that "On page 52 of the 1965 Amaryllis Year Book, you quote Mr. C. A. Campbell of Caringbah, New South Wales, as saying that to combat red leaf spot of *Amaryllis*, he had success with a spray made from 'Phenyle'. Then in an editorial note, you hope Mr. Campbell will give more information as to its composition. . . . Mr. Camp-

bell kindly sent me a label from a bottle of 'Phenyle' which proved to be a sheep dip composition used in Australia, with phenol as one of its components."

The members will be interested to know that in 1964, Louisiana State University conferred the honorary degree of Doctor of Science, D. Sci., on Caroline Dorman, of Saline, Louisiana. This high honor is merited by Dr. Dorman who has contributed materially to art and plant science in the United States.

PLANT LIFE LIBRARY—continued from page 4.

ULTRASTRUCTURAL PLANT CYTOLOGY; WITH AN INTRODUCTION TO MOLECULAR BIOLOGY, by A. Frey-Wyssling and K. Muehlethaler. American Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1965. Pp. 377. Illus. $24.00. This stimulating text on Ultrastructual cytology by two outstanding authorities will be welcomed by biologists generally. Following the introduction to ultrastructural morphology, the subject is developed under two major headings: (1) under molecular morphology, the principles of molecular structure, macromolecules and virus particles, are discussed; and (2) under cytological morphology, organelles of the plant cell, cytoplasm, nucleus, mitochondria, plastids, cell wall, and ectoplasmic differentiation, are explained. This text belongs in the library of every biologist.

THE HANDLING OF CHROMOSOMES, 4th edition, by C. D. Darlington and L. F. La Cour. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1962. Pp. 263. Illus. $5.00. This is the 4th revised edition of a well-known text on cytological technique by two outstanding authorities. The topics included in the main body of text are: scope of chromosome work, equipment, living chromosomes, bulk fixation, smears and squashes, paraffin methods, staining and mounting, special treatments, control of mitosis and fertilization, photography, autoradiography, and describing results. The appendices are concerned with sources of material, standard solutions, schedules of treatment, and catalogue of implements. Highly recommended.

READING IN ECOLOGY, by E. J. Kormondy (editor). Prentice-Hall, Englewood Cliffs, New Jersey. 1965. Pp. 219. Illus. Paperback, $3.95. This compilation of papers covering a wide range of ecological literature is intended primarily as a textbook supplement for beginning college students in ecology, or general science, or for high school students in advanced biology. However, post graduate research workers will find these papers suitable review sources. The many papers are grouped under (1) early natural history; (2) the physical and chemical environment; (3) the study of communities; and (4) the concept of the ecosystem. Highly recommended.

THREE CENTURIES OF MICROBIOLOGY, by H. A. Lechevalier and M. Solotorovsky. McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. 10036. 1965. Pp. 536. Illus. Paperback, $4.95. The purpose of the authors has been to reconstruct the growth of microbiology, stressing the main lines of development and in this they have been successful. The chapter headings are: From Fracastoro to Pasteur; Pasteur; Koch; bacteria as agents of disease; immunology, cellular and humoral; from soil microbiology to comparative biochemistry; viruses and Rikettsiae; mycology; protozoology; chemotherapy; and genetics. This stimulating text is highly recommended.

PLANT LIFE LIBRARY—continued on page 70.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1965 AMARYLLIS SHOWS

The Official Amaryllis Shows for the year 1965 began April 3—4, with two shows on these same dates—the Corpus Christi (Texas) Show, and the Men's Amaryllis Club of New Orleans Show. Then followed in succession the New Orleans Amaryllis Show staged by the Garden Circles Amaryllis Club on April 10—11; the Houston Amaryllis Society Show on April 17; the Greater Gulf Amaryllis Show at Mobile April 17—18; and April 24—25, the two shows: the Hattiesburg (Miss.) Amaryllis Society Show and the first Southern California Amaryllis Show at Arcadia, Calif., staged by the Southern California Hemerocallis and Amaryllis Society.

Mrs. Polly Fox, Corresponding Secretary, of the Greater Houston Amaryllis Club, reports that "Although we had a rather mild winter, the month of March was very cold and overcast and our Amaryllis did not develop enough blooms of show quality to warrant a show. This was very disappointing to us all. We will be in there pitching to put on a good show next year. The date of April 17 (the Sunday after Easter) has been reserved for the Garden Center to accommodate the Show."

1965 CORPUS CHRISTI AMARYLLIS SHOW

MRS. CARL C. HENNY, *President*,

Coastal Bend Amaryllis Society, Corpus Christi, Texas

The Coastal Bend Amaryllis Society conducted its annual Amaryllis Show in conjunction with the Lola Forrester Flower Show, held here in the Exposition Hall, April 3rd and 4th, 1965. Due to very unpredictable weather conditions this winter, our exhibit was not as good as we had hoped for. We had only 67 entries of *Amaryllis* in comparison to 96 entries of last year.

Among the pot-grown registered Leopoldii Type entries were: 'Franklin Roosevelt', 'Front Page', 'Mother's Day', 'Brilliant', 'Champion's Reward', 'Masterpiece', 'Rocket', 'Prima Donna', 'Spring Dream', 'Apple Blossom', 'Ace', 'Candy Cane', 'Fantasy', 'Early White' and 'Ludwig's Dazzler'. Members receiving blue ribbons in these were Mr. Charles Sanders and Mrs. L. Materne; red ribbons were received by Mr. H. E. Lemoine, Mrs. Carl Henny, Mrs. L. Materne and Mr. Sanders.

Mr. Fred Jones received a blue ribbon in the "Breeder's Class" for his seedling—'Dutch to Dutch'.

In the Garden-grown registered and named plants, Mrs. Carl Henny received a blue ribbon for 'Prima Donna'. Mrs. E. L. Caldwell received

a blue ribbon on her cut scape garden-grown, unnamed.

In the Miniature—Gracilis type, Mr. H. E. Lemoine received a blue ribbon for his 'Fire Fly'; Mr. Charles Sanders, blue for his 'Little Sweetheart' entry.

An added attraction to our exhibit was an outstanding flower arrangement of amaryllis blossoms prepared by Mrs. E. L. Caldwell, a member of our Society.

Another display of equal interest and importance was a Special Exhibit prepared by Mr. Fred Jones, club member,—entitled "From Seed to Mature Plant". Mr. Jones received a "Green Ribbon Special Award" for this display.

Three Accredited National Amaryllis Judges from San Antonio, Texas were here to judge our show. Twenty two blue ribbons, 15 red ribbons, 12 gold ribbons and three white ribbons were awarded, making a total of 52 awards.

OFFICIAL MEN'S AMARYLLIS CLUB SHOW NEW ORLEANS 1965

James E. Mahan, *Show Standards Chairman,*

3028 Palmyra St., New Orleans, La. 70119

The eighth annual show was held by the Men's Amaryllis Club of New Orleans, Inc., on April 3rd and 4th, 1965 at the Edward Hynes School, 990 Harrison Avenue. As in the past the show was all horticulture devoted exclusively to *Amaryllis* with competition open to the public. It attracted numerous entries other than those of club members and drew many visitors not only from New Orleans but also from other points in Lousiana, Alabama, Mississippi, Texas and even from Kingston, Jamaica. The show was well conceived by Show Chairman Walter Latapie and set up in accordance with official rules as set forth by the American Amaryllis Society with which the local club is affiliated. Nine Official Amaryllis judges made the various awards.

The usual ribbons for first, second, third and honorable mention were awarded in the various sections and classes. In addition to ribbons the following trophies were awarded: Jessee Nursery Gold Cup for best Dutch hybrid, to Rodney Broussard; Reuter Seed Co., Inc., Gold Cup for sweepstakes winner in Dutch hybrid, to Rodney Broussard; Swetman Silver Cup for runner-up in Dutch hybrid class, to Rodney Broussard; Swetman Amaryllis Garden Silver tray (challenge) for winner of most blue ribbons in Dutch hybrid class, both potted and cut specimens, to Rodney Broussard; the President's trophy Gold Cup for most blue ribbons won by a member of the Men's Amaryllis Club, to Rodney Broussard; W. J. Perrin Silver Tray for outstanding registered specimen in owner's possession for one year or more, to Rodney Broussard; Alatex Construction Service, Inc., Gold Cup for best home-bred, grown and developed Amaryllis, to E. M. Beckham.

American Amaryllis Society Awards of Merit were given to Messrs. Beckham, and Broussard and Preliminary Commendations went to Messrs. Beckham, Milo Virgin and W. C. Creecy.

The Alatex trophy which was donated through the courtesy of Mr. Lewis Lloyd, a member of the Men's Amaryllis Club, is a new addition to the list of trophies and is designed to encourage the individual enthusiast to "start from scratch", from selective breeding and then bringing to maturity and exhibiting the results of his own efforts. This,

Fig. 7. Part of exhibits at the Men's Amaryllis Club Show, New Orleans, 1965.

in turn, will encourage others to follow the same course and thus further increase breeding and development of new clones by the amateur. The W. J. Perrin award, new this year and donated by another member of the club, is also designed to encourage exhibitors to exert themselves toward positive action on their own part to bring the plants to perfection through their own efforts rather than accept and exhibit a "ready-made" package which is the result of someone else's handiwork.

The rewards of one's own breeding efforts were amply demonstrated by an exhibit in the show, entered by Mr. Walter Latapie, who

developed a new double specimen, nearly pure white (see Fig. 13) with merely a few red lines in some of the inner petals. It is a very handsome and striking seedling which certainly must be satisfaction and incentive enough to the breeder to continue his efforts.

Plans for the coming year's show are already in progress and we are looking forward to an even greater show when next spring rolls around. The date has been set for April 16th and 17th, 1966 and a cordial invitation to attend the show is extended to all *Amaryllis* lovers.

1965 OFFICIAL NEW ORLEANS AMARYLLIS SHOW

Mrs. A. R. Oddo, *Show Chairman*,
435 Bonnabe Blvd., Metairie, La. 70005

The 16th Official Amaryllis All Horticulture Amaryllis Show was held Saturday, April 10th and Sunday, April 11th, under the sponsorship of the Garden Circle Amaryllis Club. Mrs. A. R. Oddo was general chairman, and Mrs. Ed. Landry, Club President was honorary chairman.

The Award of Merit for the best specimen of Dutch Horticulture, presented by the American Amaryllis Society, went to Edward Beckham of Baton Rouge, La. for a A Happy Memory entry which also was awarded the Ludwig Challenge Cup. The Reuter Seed Company Tray for the most outstanding Dutch Specimen also went to the Award of Merit Winner in Dutch Horticulture Mr. Edward Beckham.

The Award of Merit for the best specimen of American Horticulture went to Miss Elizabeth Weed. The Harry St. John Memorial Challenge Trophy for the most outstanding American specimen also went to Edward Beckham. Awards of Merit, presented by the American Amaryllis Society, for specimens in American horticulture, went to Edward Beckham and George Merz, Jr.

The Klein Award, Silver Tray for the most blue ribbons in Dutch Horticulture, went to Edward Beckham.

The Sweepstakes trophy a gold cup for the most blue ribbons in American Horticulture was presented to Mrs. Walter R. Latapie of the Garden Circle Amaryllis Club who also won the Single Floret Award to Members Only.

A special award, A Silver Tray, for the best two-floret entry went to James Robertson of the Men's Amaryllis Club of New Orleans, La.

Awards of appreciation went to non competitive arrangement exhibitors as follows: Mrs. Fernando Cuquet, Sr., Mrs. Richard Heaney, Mrs. John Hennessy, Mrs. A. L. Herberger, Mrs. Casey W. Jones, and Mrs. Tully Ward.

Blue Ribbon winners in Dutch Horticulture were Milo C. Virgin, Melvin Zivicki, George Merz, Jr., Edward Beckham, Mrs. Miriam G. Authement, Mrs. Edna Dopp, Mrs. W. J. Perrin, and James Robertson.

Blue Ribbon winners in American Horticulture were Mrs. W. R. Latapie, Mrs. W. J. Perrin, Mrs. F. L. Ramos, Mrs. A. A. Autry, Miss

Edith Dickenson, Mrs. Rosina Tamburello, Mrs. Miriam G. Authement, Melvin Zivicki, Mrs. W. C. Creevy, Miss Elizabeth Weed, Miss Antoinette Weed, Santo Cuchinotto, Mrs. E. Dopp, Mrs. Jessie Solis, and Mrs. Josie Davis.

The Gold Cup the Public School Award won for the past five years by McDonogh #7 School was presented to them for permanent possession.

The Award of Merit were presented as follows: Mr. Edward Beckham, 'Happy Memory', Mr. Edward Beckham, 'Zenith', Mr. Edward Beckham, 'Streaking Stripes', Mr. Edward Beckham, 'Carousel', Mr. Geo. Merz, Jr., 'Alcyone'.

Preliminary Commendations were presented as follows: Miss Elizabeth Weed, Named American 'Gernato'; Milo Virgin, White Seedling; Mrs. Walter R. Latapie, White Double Seedling; Miss Edith Dickenson, Pink Seedling; Melvin Zivicki, Pink Dutch Seedling.

There were six Invitational Arrangements displayed on Pedestals by non Competitive Guest Artists. The 16th Official Amaryllis Show was displayed by Divisions 1 to 9 as per Revised Show Schedule for Official Amaryllis Shows (in 1961 Amaryllis Year Book). There were 228 entries in the Show.

1965 OFFICIAL HOUSTON AMARYLLIS SHOW

Mrs. A. C. Pickard, *Show Standards Chairman,*

1702 North Blvd., Houston, Texas 77006

The Houston Amaryllis Society's Official Show was held in the auditorium of the Garden Center, April 17, 1965.

It was based on the theme, "Amaryllis on Parade". The weatherman was very temperamental and full of tricks, so many sudden changes. However, the dark clouds turned to silver and the Society staged a very successful show.

Classification in the five divisions included named and registered Dutch cultivars and American hybrids by color, with separate sections, including the cut and potted specimens.

In addition to the classes of cultivars, specimens of more than one hundred seedlings were displayed on a non-competitive basis, all grown by members of the Society.

Collections, minimum of five named and registered cultivars, all different, added extra beauty in the collection class.

All classes were judged by official Amaryllis judges.

Special ribbon awards were given in the invitational class for cut specimens of named and registered Dutch and American Amaryllis.

The Educational exhibit consisted of methods of propagation from seed to clone; and a sexual propagation of bulbs. This section merits horticultural achievement on the highest level.

Much interest centered around the Amaryllid section of potted "Clivia" in full bloom; and cut specimens of *Crinum* x *powellii album*, and *Ornithogalum*.

In the Artistic Division of the show (non-competitive), members were given an opportunity to show their talents as creative artists in flower arrangement.

One of the most interesting special exhibits of the show was "Easter Parade", displayed on the stage of the auditorium by a local florist which could only be rightly portrayed in Kodachrome.

The special awards table, staging all the medal winners was the center of attraction and proved the outstanding success of the show:

Fig. 8. President, Mrs. Tracy T. Word, at the special awards table, Houston Amaryllis Society Show, 1965.

'Square Dance' (Lud) R; A-704, D-5B, A.M. and award of Excellence—Mrs. H. W. Blair

'Boquet' (Lud) R; A-424, D-5A, A.M. & Ludwig Cup—Mr. M. B. Quigles

'Maria Goretti' (Lud) R; A-445, D-5B, A.M.—Mrs. T. T. Word

'Fire Fly' (Lud) R; A-469, D-8, A.M.—Mrs. M. E. Shelton

Collection of 5 named and registered Dutch Cultivars, A.M.—Mrs. A. C. Pickard

'Spring Dream' (Lud) R; A-542, D-5A
'Television' (W-WS) R; A-691, D-5A
'White Crane' (Goed) R; A-681, D-5B
'Apple Blossom' (Lud) R; A-422, D-5B
'Catherine Valente' (W-WS) R; A-688, D-5B

Breeders Class, "American Seedling" P.C.—Mrs. R. I. Stansbury
Breeders Class, "Dutch Seedling", P.C.—Mr. M. B. Quigles
Non-competitive, Invitational Class: 'Apple Blossom' (Lud) R; A-422, D-5B—Mrs. E. R. Bertgstrom; 'Reginae hybrid' - D; 4-B, P.C.—Mr. Earlton Koon

The Houston Junior Amaryllis Society and Junior Garden Club, sponsored by the Houston Amaryllis Society, presented their section of exhibits on horticulture, nature and conservation, and an educational display.

This year introduces the first in classes of Artistic Design and a class of dish gardens and terraniums with naturalistic planting.

Junior sections are given increasing prominence with more Junior exhibits a "natural" for their talents.

Another year of most interesting and rewarding effort has come to a close for a plant society of great appeal and which furnished a wealth of excellent horticultural information.

GREATER GULF AMARYLLIS SHOW, MOBILE, 1965

Miss Mildred Laughlin, *701 Dauphin Isle Parkway, Mobile, Alabama 36606*

The Amaryllis Society of Mobile, Alabama presented AMARYLLIS EASTER PARADE at their Thirteenth Annual Greater Gulf Amaryllis Show on Saturday and Sunday, April 17 and 18, 1965, in the Murphy High School Cafeteria; admission free.

The focal point of interest was a large white cross in the center of the building with Amaryllis attractively arranged at its base. The artistic Designs were calculated to carry out the theme further.

Officers of the Society for 1964-1965 are as follows: President, W. A. McCollum; Vice-President, S. A. Shannon; Secretary, Mrs. A. B. Palmer; Treasurer, J. C. McRae.

S. A. Shannon officiated as Show Chairman and Master of Ceremonies; and serving as his Co-Chairmen were: W. A. McCollum, Russel Ludlow, J. C. McRae.

Standard Judging was done by accredited judges and trainees from Mississippi and Florida.

Beautiful silver trophies were won by the following:

W. A. McCollum, Winner of the most Blue Ribbons in Show, including Horticultural and the Artistic Arrangements Division. Sterling Silver Paul Revere Bowl.

Mrs. M. E. Chancey, Winner of the most Blue Ribbons in the Artistic Arrangements Division. Sterling Silver Vase.

W. A. McCollum, Winner of the most Blue Ribbons in the Combined Dutch Hybrid Potted and Cut Amaryllis Divisions. Large Silver Tray with handles.

Mrs. Gertrude Marshall, Winner of the most Outstanding Horticultural Potted Bulb Specimen of Dutch Amaryllis in Show. Sterling Silver Sandwich Tray.

W. A. McCollum, Winner of the most Blue Ribbons in the Dutch Hybrid Potted Amaryllis Division. Silver tray with handles.

W. A. McCollum, Winner of the most Outstanding Horticultural Potted Bulb Specimen of American Hybrid Amaryllis in Show.

Mrs. W. P. Cazalas, Winner most Outstanding Artistic Arrangement of Amaryllis in Show.

Mrs. Virginia Sherwood, Winner best painting of Amaryllis (Adult Section).

Maxey J. Roberts, Winner Best Painting of Amaryllis. (Student of Art 16 years of age and under.)

Herbert O. Hackmeyer, Winner most Outstanding Horticultural Cut Specimen of Dutch Amaryllis in Show.

Mrs. H. R. Young, Winner of the most Blue Ribbons in the Dutch Hybrid Cut Amaryllis Division.

W. C. Strain, Winner most Outstanding Horticultural Cut Specimen of American Hybrid Amaryllis in Show.

Rose Garden Club, Trophy awarded for the Blue Ribbon Winner in the Invitational Class (Open to Garden Clubs only.)

Mrs. W. A. McCollum, winner most Artistic Design of Amaryllis with Elements other than Fresh Plant Material Predominating.

Miss Darby Hickson, Winner Trophy awarded to the Junior with the Most Blue Ribbons.

The following won Annual Awards to be retained by the first year winners permanently: W. A. McCollum, winner most Blue Ribbons in the Dutch Named Clones. Sterling Silver Cup. Maxwell E. Stewart, winner most Blue Ribbons in the Single Bloom Named Division.

Wilmer Smith was winner of four trophies as follows: Most Outstanding Hobby Collection of Amaryllis. Silver Cup; Most Blue Ribbons in the Unnamed Cut Seedlings. Silver Bowl; Most Blue Ribbons in the unnamed potted seedlings. Silver Bowl; Most Blue Ribbons in the Single Bloom Unnamed Division.

In addition to these lovely trophies The Men's Garden Club of Mobile gave a Certificate of Honor awarded for Best American Hybrid Seedling (In Horticulture) Shown for First Time and it was presented to W. A. McCollum.

The trophies and awards were presented to the winners at 4 P. M. Sunday, April 18th at the Show.

Both President W. A. McCollum, and Show Chairman S. A. Shannon, stated that the membership had done outstanding work in presenting the show along with the very able assistance of the following judges: Mrs. W. S. Barlow, Mrs. Jessie Barfield, Mrs. E. S. Northup, Mrs. Riley

Moffett, Mrs. Florence Renau, all Pensacola; Mrs. M. G. Ness, Mrs. Dewey Regan, both from Biloxi, Miss., and the following from Hattiesburg, Miss.: Mrs. M. M. Thomas, Mrs. R. A. Fowler, Mrs. U. J. Lucas, Mrs. Charles Bell, Mrs. B. P. Russum, Mrs. B. M. Lewis, Mrs. Sam Forbert, Mrs. J. W. Snowden, Mrs. F. T. Newton, Mrs. I. M. Culpepper, and Mrs. L. M. Davis.

1965 OFFICIAL HATTIESBURG AMARYLLIS SOCIETY SHOW

Mrs. Luther N. Davis, *Society President*

2206 Hardy Street, Hattiesburg, Miss.

The officials of the Hattiesburg Amaryllis Society have marked "Complete Success" across their records for the 1964-65 society year that came to a close with the staging of the Society's Fifth Annual Show that was in every respect the most successful in the history of the organization.

Even though the weather during the winter had been most unfavorable in this area the enthusiastic members of the Society and their host of friends who are growers and exhibitors of this majestic flower showed both courage and skill in bringing their *Amaryllis* through the dreadful winter with very little noticeable damage.

From a very small beginning when the Society was organized, July 14, 1956, the interest has steadily increased until today the Hattiesburg Amaryllis Society has taken its place among the largest and most alert groups in the entire country, and its shows rank with the best anywhere.

Outgrowing the show rooms of the Hattiesburg Garden Center, the show this year was moved to the Community Center which afforded a highly appropriate place for the hundreds of exhibits that were of unusually high quality. The show was open Saturday evening and Sunday evening (April 24-25) and hundreds of visitors from several states viewed the magnificent showing of the majestic *Amaryllis* exhibited by local growers.

The horticulture section of the show was especially strong this year with a profusion of potted Dutch hybrids with first places going to displays of 'Cardinal', 'Lucky Strike', 'White Giant', 'Happy Memory' and many others. Mrs. L. T. Brown, Mrs. Charlie Bell, Mrs. A. M. Wilson and Mrs. R. A. Fowler were winners in this category.

In the seedling category first place awards went to Mrs. O. F. Coursey, Mrs. Charlie Bell, Mrs. Sam Forbert and Miss Evelyn Arledge.

Mrs. Charlie Bell won the American Amaryllis Society Award of Merit Certificate for her 'Faust' and 'Albino'. An American Amaryllis Society Award of Merit went to Miss Evelyn Arledge of her Candy Cane.

In the artistic design section where the theme "Motion In Space" was appropriately carried out, Mrs. B. M. Lewis won first place, and she also won the Tri-Color Award in this category.

In the exhibition table display firsts went to Mrs. B. M. Lewis and Mrs. Paul Bailey.

Highly coveted silver tray awards were made to Mrs. Charlie Bell who won the President's Award and the horticultural sweepstakes award. Mrs. Sam Forbert gained the silver tray for the best potted *Amaryllis* in the entire show while Miss Evelyn Arledge won the silver award for the best potted specimen of Dutch *Amaryllis* in the show. Mrs. Melvin Thomas won a silver award for the best cut bloom in the show. The tray for the most blue ribbons in the show in the Dutch Hybrid Class went to Mrs. Leonard Brown while Mrs. Charlie Bell gained the award of a silver tray for the most outstanding unnamed seedling in the show.

In the single bloom category blue ribbons were won by Mrs. Luther N. Davis, Mrs. O. F. Coursey, Mrs. Ruth Bethea, Mrs. L. T. Brown and Mrs. Knox Cole.

Space will not permit a full description of this outstanding show but all agreed that in both quality and quantity it was the most outstanding exhibition of the Society's entire history. Attendance at the show broke all previous records and many visitors have assured the Society that next year will find them among the exhibitors.

The Hattiesburg Amaryllis Society is well on its way with enlarged plans for the new year and it is looking towards the spring show with an abundance of enthusiasm.

FIRST SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW 1965

Mrs. Bert Williams, *Show Chairman*,
2601 La Prensa, South San Gabriel, Calif. 91777

The first Official Amaryllis Show ever to be held in Southern California was staged at the Los Angeles State and County Arboretum, 301 N. Baldwin Ave., Arcadia, Calif., by the Southern California Hemerocallis and Amaryllis Society on April 24 and 25, 1965.

The show was a real success in spite of uncooperative cold weather, which had delayed most outdoor spikes, and despite the fact that much of the display hall had been relinquished to the spring flower show, which had been rained out twice on earlier scheduled dates. By dint of diligent searching by the show committee, a very substantial number of exhibitors participated and had entries in a large part of the scheduled twenty-two classes. Over eight thousand visitors came through the turnstiles at the main gate, indicating a very creditable attendance for this first show.

Awards included the S. August Phillips Trophy, given to Mr. Hubert C. Lloyd for the best seedling, a fine orange scarlet; the President's Trophy awarded to Mrs. Eva Turnquist for the most popular exhibit in the show, an extremely beautiful potted specimen of 'Purple Queen' (Warmenhoven); the sweepstakes prize, the Cecil Houdyshel

Memorial Trophy, a handsome silver bowl perpetual trophy established to honor Cecil Houdyshel, who died in 1964, went to Mr. W. Quinn Buck, who had the largest number of blue ribbons in various classes. *Amaryllis* bulbs were given as awards to the winners of blue ribbons. Many of these bulbs were fine new Dutch clones donated by Mr. Robert Goedert, of Jacksonville, Fla., a leading importer.

Fig. 9. Part of the exhibits at the First Southern California Amaryllis Show, 1965. Photo by Jack V. McCaskill.

A special award was given for the three beautiful amaryllis arrangements shown by Chadwick Gardens of Redondo Beach, Calif. Although not in competition, these arrangements were most outstanding for the quality of the white, rose, and salmon scarlet Dutch strain seedlings used to make them up, the rose group being especially fine in color, shape, and texture.

EMPHASIS ON JUDGING AMARYLLIS

Mrs. A. C. Pickard, *Houston, Texas*
Official Amaryllis Judging Instructor

There is a growing consciousness that working knowledge of horticulture is a vital part of our growing the plants and judging them at flower shows which feature a particular flower, and where at least a year's study and cultivation of this flower precedes the show.

People who exhibit *Amaryllis* would be much better exhibitors if they would take a little time to study the rules for Amaryllis shows by which all Amaryllis Judges work.

The primary objective of the Judges Training course is to train Judges and up-grade judging standards. A judge must be of unquestioned integrity, and should have the interest of the Amaryllis Society at heart.

The importance of membership in the American Amaryllis Society (A. A. S.) was recognized very early after its founding. A candidate for a judgeship must be a member of the A. A. S. and have a record of attendance at Judges' Training Schools. As long as progress is being made in all classes of Amaryllis, the Judges Training Program must be considered in terms of continuous effort to provide the highest possible standard of judging.

Your A. A. S. gives you a classification system for all Amaryllis designed to maintain order and recognition for all species, named and registered, and unnamed horticultural clones.

A registration system is used to prevent chaos about clones in commerce. An award system gives full recognition of clones of outstanding quality and promotes development of new classes of Amaryllis.

It is possible that in future years, other specialized awards may be instituted by the Society in recognition of interest and progress in various special sections of the Amaryllis tribes.

Remember, judging is not difficult if you retain an open mind and a knowledge of the flower you are judging. Never be afraid to ask questions which might help you with a decision. No one is expected to know everything.

With descriptive catalogues from leading hybridizers, we enter a new era of Amaryllis production, and it is evident the new systems, based on their horticultural qualities, will provide the key to better understanding of the nine major classification divisions and additional necessary categories.

It is impossible to deal with all the conceivable factors which may arise in judging. Otherwise, the subject would become so technical and complicated that it would defeat its purpose. Those who are just getting acquainted with Amaryllis may find certain descriptive terms puzzling.

The following short glossary will explain some of the words and terms used in Amaryllis language:

(a) Species—kinds of plants as they appear in nature before hybridizing.

(b) Hybrid—a plant resulting from the cross between two parents differing in one or more traits; i.e.—a cross between two species, a species and a hybrid, or between two hybrids.

(c) Cultivar—kinds that are maintained under cultivation; may include cultivated species and hybrids.

(d) Perigone—a flower form in which the free divisions above the tepal tube are similar and arranged in a circle, surrounding the sexual organs of the plant—pistil and stamens.

(e) The six segments—3 outer are setegs, and 3 inner are petsegs; when taken together they are known as tepalsegs, or the limb.

All visible parts of the Amaryllis must be recognized in relationship to the whole. It is evident that there are many qualities which could be given importance in judging.

Point scoring should be followed and used to assess the relative importance of the different qualities specified, and all qualities must have ample consideration from the judges.

Competitive entries must be made according to divisions and classes included in the comprehensive schedule.

To judge a horticultural specimen, one attempts to measure perfection or quality and the faults.

Certain factors have been considered and a scale of points ranging from 0 to 100 established for scoring a specimen. Every judge is an individual with ideals of perfection and his own ability to see how nearly the flower before him matches his ideals.

At this point it may be helpful to elaborate a bit upon the several characteristics rated on the score card.

The form of the flower is the basis of classification. By this method genera, species, and varieties are identified and named within these gradations of form. Types can be recognized and workable definitions of these types can be written, permitting the classification of all Amaryllis according to type.

In Divisions 2 and 3 drooping is normal and should not be penalized but in other divisions, the somewhat more erect form is favored.

However appealing a certain Amaryllis may be to its owner, however artistic he may regard its formation, to win in a show it should excel by most nearly attaining a recognized standard of excellence in respect to form.

To add to point scoring, every flower has various attributes, physical or otherwise that make it more or less beautiful. Point scoring is simply the numerical expression of the value of each characteristic, point by point. The total points comprise the numerical rating by means of which you can compare the flower to another of like kind. The most natural way to appraise anything is to compare it with other similar kinds. Do not hesitate to use Point Scoring, for there is no more useful tool when wisely used.

Flower shape (form) receives 15 points and refers to shape of the bloom, stage of development, seg formation, conformity to type or variety.

Color—note that nearly half of the total points, 45, have been alloted to color, due to the fact that color is the most important attribute of an Amaryllis. The quality of the color may be notably enhanced by the texture of the segs. Texture is the term employed to describe the surface of the segs. The segs may have a dull texture, or satiny sparkling texture which veritably makes the flower "sing".

Color quality may respond to a certain extent favorably to cultural care, skillful handling of sunlight or shade, fertilizing, soil ingredients, climate moisture, etc.

Not to engage in an exhaustive discussion of the theory of color, it may be useful to point out the lighter tones of any color produced by reduction of the color content by white, diminishes the intensity of color, changing its tone or color value without altering its clarity.

In self colored Amaryllis, study the spread of color on the floral segs. It should be even, not streaked or veined.

In blends, there should be harmonious contrasting component colors. Otherwise, harshness results.

Bi-color is a clear separation of the contrasting colors with a minimum blending of darker into lighter color components. Preferably all segs should carry a substantial proportion of each color on its face. "Striped" refers to vertical bands or stripes of different colors.

Size—score value 15 points: Size is another character which is related directly to the division standard. In miniatures (intermediates) smallness contributes to daintiness. The pose of the flower on the scape is important enough to give it point consideration. For example—the Leopoldii hybrids being formal and flat have an asset in size. In certain Reginae hybrids (the less formal), if the flowers were too large they would be out of proportion in form.

Length and character of scape—score value 15 points: This character too represents harmony. It should be in proportion to the size and number of blooms. A strong, erect, graceful scape a trifle too long, other things being equal, is preferable to one too short. Heavy scapes with small flowers sometimes indicate forcing and, this condition destroys the gracefulness of the effect.

Number of flowers per scape and number of expanded flowers—rating 6 points: Buds are not considered expanded flowers but contribute toward classification and separation of judging a two flower scape with no evidence of another flower in competition with two expanded blooms and a bud. Only 3 or more flowers per scape are eligible for competition. For two expanded flowers per scape allow 3 points; for 3 flowers allow 4 points; for 4 or more flowers allow 6 points; Usually more than 4 open blooms per scape seem too crowded for good form. In miniatures, allow 4 points for 2 flowers and 6 points for 3 or more flowers. Miniatures flowering habits are from 2 to 6 flowers per scape.

Number of scapes per plant—allow 10 points: This category applies only to potted exhibits. Allow 8 points for one scape; 9 points for 2 scapes; 10 points for three scapes. It is hardly likely that any entry of three scapes will reveal no faults in any of its characteristics and is rarely seen in a show.

Fragrance—alloted 2 points: Amaryllis are not noticeably fragrant and the presence of fragance is to be considered an asset. Some few species are recorded as slightly fragrant. If so, it is passed on in future generations. New fragrances have been produced from time to time but such new introductions will never permeate the home gardens with the delightful fragrance of a rose. Many flowers produce nectaries for the production of nectar and are of value in attracting insects that transfer pollen to the stigma of the blossoms thus carrying out pollination in nature.

Foliage—2 points: This applies to potted plants. Leaf growth that comes with the flower scape enhances the beauty, but some clones are slow to produce foliage until the flowers have appeared. Temperature control on a newly purchased bulb may have some effect on growth

of foliage. A high temperature will often produce lush foliage at the expense of a bloom scape.

Condition of exhibit—12 points for cut specimen, 10 points for potted plants: The really superb bloom is a candidate for a category called Distinctiveness. This has to do with the staging of the exhibit as well as with those attributes which tend to make it stand out supreme and proclaim its quality. A keen judge quickly recognizes the difference between a bloom scape casually stuck into a container and one whose scape is properly proportioned. Plants are too often injured in transportation to a show. The injuries will affect judging value.

Ten (10) points alloted for potted plants: Our score card takes full account of every factor which actually goes into the condition of an exhibit. Plants in prime condition are to receive full allowance points. It is permissible to remove any fading scapes and flowers. Proper and skillful cultural practices will be reflected in the general condition. Prime condition exists when the bloom is clean, no fading (over maturity), or loss in substance, or injury in any part.

Another removal: Such removal is allowable by the local show schedule committee in order to prevent pollen dusting on the segs in transit, which often mars the beauty of a pure color. Over ripened pollen and position of the stigma will usually reflect the age of the bloom.

Staking: Pot plant scapes grow tall and it is necessary, sometimes, to stake them. If the stake used does not attract attention to itself and if green twistems are used for tying, then no points are deducted. If the stake or tie is too conspicuous, then some deduction must be made.

It is sometimes difficult for judges to decide the number of points to deduct for a slight defect. One method is, if a fault is barely noticeable, deduct a couple of points. If the flower is only half as good as it might be, deduct half of the points. This gives plenty of room to add or subtract a point or two where it might be necessary for a final decision. A judge should be aware of the variations due the light factor, temperature and cultural practices.

In conclusion, it is evident that there are many qualities which should be given important consideration in judging. It is necessary for the schedule to set the standard which will fit the classes and guide the exhibitors and judges.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1965 Amaryllis Year Book (pages 50-51), the following numbered Amaryllis Judges Certificates have been issued by the American Amaryllis Society:

150. Mrs. Gladys L. Williams, 2601 La Prensa Av., South San Gabriel, Calif. 91777 (Horticulture only).
151. Mr. W. Quinn Buck, 26 East Camino Real, Arcadia, Calif. 91006 (Horticulture only).

152. Mrs. Eva Turnquist, 3342 N. Muscatel, South San Gabriel, Calif. 91777 (Horticulture only)

153. Mr. Jack McCaskill, 25 South Michillinda, Pasadena, Calif. 91107 (Horticulture and Arrangements).

154. Mr. H. L. Bush, P. O. Box 1371, Columbia, South Carolina 29202 (Horticulture and Arrangements).

Fig. 10. Amaryllid collected by Dr. C. G. Rueppel. Upper, shows native Andean habitat; 9,000 ft. elevation at Argentine-Chile border. Lower, close-up of flowers; golden yellow in color.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

AMARYLLIDS COLLECTED BY DR. RUEPPEL

Joseph C. Smith, M. D.

It has always been difficult to obtain from South America as much live plant material for study as would be required to pick up some of the remaining unidentified species of amaryllids. Many botanists feel that ultimately over a hundred *Amaryllis* species alone may be described. With the seventy or so now catalogued this leaves at least thirty to go.

The Society is indebted to Dr. C. G. Rueppel, Casilla 370, Mendoza, Argentina, for collecting of two very interesting or possibly entirely new species, one in the genus *Amaryllis* and one in the genus *Rhodophiala*. Dr. Rueppel is an ardent amaryllid enthusiast who makes numerous collecting trips about the lower half of South America in search of new material. He is now in the process of retiring which takes about a year in his country, Argentina. Afterward he will have more time to travel and search out unusual plants. It is hoped he will remain in good health and able to make these trips for many years.

Dr. Rueppel recently forwarded to the writer a few bulbs of the most remarkable miniature *Amaryllis* species belonging to the striata group. The flower is long lasting about three and one-half inches in diameter with a much shorter tepaltube than in the striatas. On opening it is somewhat more formal in shape, but as it matures the aspect changes to a somewhat irregular shape, with the two lower setsegs falcate. It is even smaller than *Amaryllis traubii*. Had this one been available when the Dutch hybridizers created the Gracilis strains, real pixies would have resulted with the slender eight- to ten-inch scapes of *Amaryllis* "Agrilaga", the name with which this species comes to us from Santo Tomé.

Mr. Pablo Argilaga, a good friend of Dr. Rueppel for whom he names this *Amaryllis* species, lives in Santo Tomé, Corrientes. This amaryllis is stated to be growing everywhere along the banks of the Uruguay River under dense shade in "rich, sandy, stony, peaty, wet soil." It produces many offsets which result in a clump of plants.

The new *Rhodophiala* species has not flowered here, but we do have two interesting photos (see Fig. 10) from Dr. Rueppel of its native habitat and close up of the flower. It is an intense yellow color. It cannot so far be placed with any of the described species and may be a new species of *Rhodophiala*. Dr. Rueppel collected it near Lago (lake) del Maule on the Chile-Argentina border at an elevation of 9,000 feet where the ground is covered with snow during the Winter months. The bulbs are deeply seated in rich, sandy loam. From the color photos this appears to be a very pretty species with flowers that may rival the yellow *Lycoris*. Nothing is known of its culture, but coming from a high moun-

tain terrain it may require an acid soil and enough winter cold for complete dormancy.

There are so many of the *Rhodophiala* species that we are not growing in this country, and who knows how many yet undescribed species there may be, that we are much indebted to Dr. Rueppel for his service to the Society in supplying these amaryllids. He has promised to send along many others as he obtains them on his collecting trips.

AMARYLLIS CALYPTRATA HYBRIDS REPORT, 1965

W. Quinn Buck, *Arcadia, Calif.*

Since earlier crosses of *Amaryllis Calyptrata* on two Ludwig white clones gave such interesting results, another such combination was tried in the spring of 1963. The white seed parent was a beautiful seedling tentatively named 'Peg Dabagh', selected out of a population of around 120 from a cross of Ludwig strain whites. The pollen came from one of the original *Amaryllis Calyptrata* bulbs flowered at the Los Angeles State and County Arboretum in Arcadia.

The seed of this cross were planted on April 9, 1963, and the first spike appeared on a ridiculously small seedling just a bit over two years later.

Our two pictures in Fig. 11 show side and front views of this first spike of 'Peg Dobagh' x *Amaryllis Calyptrata*. So much of the grace and charm derived from the orchid-flowered *calyptrata* parent were evident that it seemed worthy of recording this first spike. This seedling also gave no pods when selfed or crossed with named clones, as was true of the earlier crosses.

AMARYLLIS VITTATA RE-DISCOVERED

Mrs. Robert E. Herold, *203 Cromwell Drive, San Antonio, Texas 78228*

Through the efforts of Mrs. Paul A. Kane, chairman of the General Amaryllid Committee; Mr. Claude W. Davis, Professor Emeritus, Agricultural Extension Service, Louisiana State University; Sister Mary Clare, C. D. P., Academic Dean of Our Lady of Lake College and Dr. Hamilton P. Traub; at long last, I have identification on a lovely little *Amaryllis* that I have grown and enjoyed for about twenty years.

On June 2, 1965, Dr. Traub identified the botanical specimen as *Amaryllis vittata* L'Hérit., culminating ten years of asking gardeners, writing inquiries and answering letters after my mentioning of it in the 1964 Amaryllis Yearbook. (For further reference, read page 112, TRIBE AMARYLLEAE by Traub and Moldenke, 1949).

My first clone was given to me by my mother-in-law, the late Mrs. J. F. Herold of Corpus Christi, Texas who in turn had received hers from one of her daughters, Mrs. Jack Hamilton of Corpus Christi, also; her "striped lilies" coming from her mother-in-law, a Mrs. Hamilton of Goldthwaite, Texas.

Like genealogy, you aren't interested or don't become interested, until the ones that might know, have already gone. My brother-in-law

Fig. 11. Front & side view of Buck's beautiful orchid-flowered hybrid **Amaryllis**; a cross between 'Peg Dabagh' and **A. calyptrata.** Photo by Jack V. McCaskill

doesn't remember where his mother secured hers, not knowing if they came from her sister-in-law who also loved and grew flowers. He remembers his mother moving bulbs with her to California after the death of his father and his sister remarking how lovely "Mama's striped

lilies from Texas'' were and how well they grew. So like the legend of the Yellow Rose of Texas, they have traveled far and wide in the hearts and gardens of many Texas relatives and neighbors, growing along the by-paths like the trees of Johnny Apple-Seed of long ago.

I have grown them in their present environment sixteen years along a winding sidewalk. The mother clone producing many offsets, I have shared offsets and thus their beauty with so many others, and also have found them very desirable in flower arrangements.

Fig. 12(1) *A. vittata* L'Hérit., showing 3 plants; one clone showing one scape past its prime, the second plant showing 2 scapes and the third plant with one scape growing among pansies.

Fig. 12. **Amaryllis vittata** re-discovered by Mrs. Robt. E. Herold, San Antonio, Texas. (1) three plants in flower; (2) Another plant; and (3) plant showing somatic color mutations.

Fig. 12(2) *A. vittata* L'Hérit, across the sidewalk between phlox subulata and bearded Iris. In background, may be seen vittata hybrids in planter box.

Fig. 12(3) Shows *A. vittata* L'Hérit., with one floret showing mutation of two segs to red, one, half red and half white and three segs normally striped mauve-red.

I have another clone that is typical but with only ½ of one seg red and the other five and half striped normally.

The original soil composition was ''black gumbo'' enriched with sand, leaf mold and barnyard fertilizers. They were grown over the years in full sunshine. They are fed an organic base fertilizer (35%

manure) 5-10-5 (Wonder-Gro) used as a top dressing. Soil is alkaline, but fertilizer is acid in reaction, containing both organic and inorganic nutrients, thereby providing food over a longer period of time.

CRINUM BRASILENSE SP. NOV.

HAMILTON P. TRAUB

In 1963, Dr. Cesar Vargas made a collecting trip for Mr. Robert D. Goedert. One of the items sent back by Dr. Varges was a *Crinum* sp. (Goedert SA63-11) which he had collected near Itajai, Brasil, "at Flor de Santa Antonio, alt. sea level, in half shade, large, pure white flowers in spring." Some of the stock was sent on to the writer for identification, and the plants flowered at La Jolla, California, in his garden, June 20, 1965. This is a very unusual *Crinum* species with obovate-triangular leaves rather short in a sub-rosette. The flowers are a beautiful pure white, excepting that the tepaltube is greenish-yellowish to yellowish, and the tepalsegs are banded pale yellowish on the outside. A search showed that such a species had apparently not been recorded, and it has been named for the great United States of Brasil.

Crinum brasilense Traub, **sp. nov.**

Foliis nonnullis obovato-triangularibus subcaespitosis; scapo 23 cm. longo; valvis spathae 2 viridibus lanceolatis; umbella 6-flora; tubo tepalorum flavida-subviridibus 12.5 cm. longis; segmentis tepalorum albis 10.7—11.2 cm. longis 2.7—3.3 cm. latis; staminibus segmentis tepalorum ¼ brevioribus; stylo segmentis tepalorum paullo breviori; stigmate capitato.

The *bulbs* are deeply seated in the soil; *leaves* several, up to 27.5 cm. long; up to 8.5 cm. wide, obovate-triangular, dull green, the larger leaves with undulated margin to 2.5 cm. inwards, arranged in a sub-rosette, the older leaves prostrate, the younger horizontal to somewhat upright; winter deciduous; *scape* up to 23 cm. tall, 1—1.7 cm. in diam. at the base, 0.9—1.6 cm. in diam. at the apex, light green, compressed, with roundish edges; *spathe-valves* 2, green, 9.3—9.8 cm. long, lanceolate, apex rounded or acute; *umbel* 6-flowered, the flowers pure white, except the tepaltube greenish-yellowish to yellowish, tepalsegs banded pale yellowish on the outside; style pale yellowish below, greenish in upper ¼; fragrant; *ovary* sessile, 1.8 cm. long, 1.1 cm. in diam, green, subglobose; tepaltube 12.5 cm. long, 6 mm. in diam., greenish-yellowish in lower 1/3, pale yellowish above, slightly declined in upper part before opening; *setepalsegs* 11.2 cm. long, 2.7 cm. wide, lanceolate, acute; *petepalsegs* 10.7 cm. long, 3.3 cm. wide, oblanceolate, bluntly acute; *stamens* about ¾ as long as the tepalsegs; *style* slightly shorter than the tepalsegs, filiform; *stigma* capitate.

Holotype (nomenifer): No. 993a+b (TRA), flowered at La Jolla, Calif., from bulbs (Goedert SA63-11) collected by Dr. Vargas in Brasil, and shipped to Mr. Robt. D. Goedert, Jacksonville, Fla., in 1963.

THE LIGHT PRIMROSE YELLOW CRINUM LUTEOLUM

HAMILTON P. TRAUB

Until recently no yellow-flowering *Crinum* species was on record, but this has now been changed with the naming of the light primrose yellow flowering species, *Crinum luteolum* Traub & Hannibal (see Plant Life 21 : 96. 1965).

The material was obtained by Mr. William Morris, formerly of Warners Bay, New South Wales, but now of Cairns, Queensland. The members are indebted Mr. Morris for his enthusiasm about the amaryllids and for his introduction of this new *Crinum*, and also for other native Australian amaryllids, including in addition to *Crinum luteolum*, *flaccidum*, *angustifolium*, and various species of *Calostemma*. In his new home State, he will be able to collect other amaryllids, including species of *Crinum*, *Eurycles* and *Calostemma*.

Crinum luteolum was pictured in Plant Life 19 : fig. 12. 1963, before it was named in the following year. The forms of *Crinum luteolum* introduced earlier had relatively smaller flowers than most forms of *Crinum flaccidum*. However, in 1965, a form of *Crinum luteolum* with larger flowers bloomed under cultivation at La Jolla, Calif. This form is taken into consideration in the preparation of the amplified description presented here. *Crinum luteolum* is related to *C. flaccidum*, but differs significantly from it. In *C. luteolum* the leaves are evergreen, larger, and the entire leaf withers with maturity; in its native habitat it flowers usually in late winter to spring; the flowers are light primrose yellow, with relatively heavier substance; the lower three stamens are shorter and grouped together, the upper three somewhat wider apart. There are other differences.

Crinum luteolum Traub & Hannibal, **descr. emend.**

Plant Life 21 : 96. 1965.

A. *C. flaccido* recedit foliis amplioribus longioribusque semper-virentibus in statu senectute omnino intermortuis; floribus crassiusculis in patria indigena tempo hiemali vernalique florentibus claro-primulino-flavis; et caeteris.

Bulb deeply seated in the soil, very large ovate, 7.5 cm. long or longer, 5.9—6.5 cm. in diam. or thicker, bulb-neck 15 cm. long or longer, 1.4—2.4 cm. in diam.; bulb-coats whitish, longitudinal veins brownish; aerial pseudo-neck above the ground, about 5 cm. long. *Leaves* evergreen, up to 10, or more, widely U-shaped in cross section, relatively long, arcuate for part of their length, the remainder resting on the ground, 120—126 cm. long or longer, 3.6—4 cm. wide or wider, narrowing to a point in new leaves, dying in upper portions with age; grass green, of medium heavy substance, margin hyaline and scaberous; entire leaf dying on senescence. *Scape* solid, flattish with rounded edges, very light yellowish-greenish, changing to slightly reddish near base, 38—40 cm. long, 1.1 x 1.9 to 1.4 x 2.1 cm. in diam. at the base, 0.9 x 1.4 to 1.1 x 1.7 cm. in diam. at the apex. *Spathe-valves* 2, lanceolate, acute or

bluntly acute, 7.2—8.3—12.5—13 cm. long, up to 2.6 cm. wide at the base, very light yellowish, finally changing to amberish or whitish, at first upright, later drooping. Umbel 6—14-flowered, flowers wide open, slightly declined at anthesis, light primrose yellow (HCC 601/1 to 601/2); odor not particularly pleasant. *Pedicels* green, 3.3—4.4—5 cm. long at anthesis. *Ovary* green, 1.2—1.8 cm. long, 4—6—7 mm. in diam. *Perigone* only slightly but definitely zygomorphic, tepalsegs not widely expanded; the lower 3 stamens fairly close together, the 3 upper farther apart. *Tepaltube* slightly curved, 3.4—4.5 cm. long, 4—5.5 mm. in diam. *Tepalsegs* of relatively thick texture, lanceolate, acute, to oblanceolate. *Setepalsegs* 4.6—8.5—9 cm. long, 1.8—2.3 cm. wide; *petepalsegs* 4.6—8.2—8.7 cm. long, 2—2.5 cm. wide. The three *stamen filaments* opposite the three petepalsegs slightly adnate to these at the base, the lower 3 somewhat close together, the upper 3 farther apart, 3.3 cm. long; anthers at anthesis 1.2 cm. long, becoming arcuate with age; versatile, introrse; pollen yellow. *Style* 1.1 cm. longer than the stamens, shorter than the tepalsegs; *stigma* minute, faintly pinkish.

Holotype (nomenifer): No. 985 (TRA), flowered at La Jolla, Calif., from a bulb collected at Pichi-Richi Pass, Flinders Range, near Port Augusta, South Australia, and sent to the United States by William Morris. No. 999 (TRA), from the same source.

Crinum luteolum is self-fertile to a limited extent and thus can be propagated from seeds, and in this way can be widely distributed in the United States. Since the plant is found in a cool location, and the bulbs are very deeply seated in the ground, it should be possible to cultivate this species as far north outdoors as middle eastern states, and even farther north on the south side of buildings with mulching protection.

NEAR WHITE DOUBLE HYBRID AMARYLLIS

W. R. Latapie, *3737 Elysian Fields,*
New Orleans, Louisiana 70122

The writer and his wife, Hilda S. Latapie, have been breeding hybrid *Amaryllis* since 1940, and one of our main objectives has been to produce white double clones. This ideal has almost been reached with the appearance of a near-white double clone (Fig. 13). This is apparently the first one of its kind in existence.

It is interesting to note that in the seed batch from which this hybrid was selected, we also obtained several other different doubles, but the "McCann" coloring predominated. These were true doubles, triples, having eighteen to twenty-one tepalsegs in each flower. In this batch also some single red and white flowering hybrids were obtained.

The double hybrid flowered for the first time during the season of 1965 when the following detailed description was made:

Length of scape: 14 inches high; number of buds: three, each blooming separately; number of petals: 21; length of flower 2½ inches; length

of pedicel: 2 inches; length of tepaltube; ½ inch; perigone width: 6 inches across; perigone 5 inches from top to bottom; color: white with cherry red faint streak each side of mid-rib, inner throat green; tepal-

Fig. 13. Beautiful double near white hybrid **Amaryllis** produced by Walter and Hilda Latapie, of New Orleans, La.

segs (size) four outer segs (setepalsegs): 2 inches wide, graduating to ¾ inches in center; three anthers with no pollen; no visible pistil; size of bulb: 8 inches in circumeference; flower has fragrance.

Leaves 1½ inches wide; neck of bulb is short.

The hybrid is a cross of 'Captain McCann' red (double) x "Maria Goretti" (White).

POLYEMBRYONY IN HYMENOCALLIS MEXICANA

Hamilton P. Traub

It is the usual practice to collect amaryllid seeds and store them in open dishes in the garage so to have them handy for distribution. Among the seeds exposed in this manner this season were those of *Hymenocallis mexicana* which blooms in late spring or early summer. The seeds soon burst the capsule walls and are exposed; and later fall to the ground. Seeds collected in early summer were stored in open dishes and produced sprouts which formed tiny bulblets at the end of the sprout as is usual with most amaryllids. On examination recently (9-26-65), it was noted that one seed had two such sprouts each with a tiny bulblet. This was unusual and had not been noted before in amaryllids. On further examination, the dish contained two additional seeds with two sprouts. Thus the original observation had been verified, and records were made. In the case of two seeds the sprouts were at opposite ends of the seed; in one, two sprouts were on the same end. Dissection of the seeds showed that each of the three seeds contained two embryos. This is the first case of polyembryony in amaryllids observed by the writer. Perhaps others have made similar observations. If this is so reports in Plant Life are welcomed.

THE TYPE OF LYCORIS AUREA HERB. 1821

Hamilton P. Traub

Herbert based his genus *Lycoris* Herb. (App. 20, 1821) on *Lycoris aurea* (L'Herit.) Herb., (Bot. Mag. Lond. 409. 1789; *Amaryllis aurea* L'Herit.). syn.—*Amaryllis aurea* L'Herit., Sert. Angl. 14, pl. 15. 1784; with descriptions in Hort. Kew 1:. 419. 1789; and Miller's Dict. ed. Mart.

Herbert in the Appendix, 1821, remarks that the flowers are pale orange, having narrow and somewhat undulated segments, with a greenish keel; style very long, stigma bright red. An examination of the plate 409 in Botanical Magazine shows that the tepalsegs are narrow, long elliptic-lanceolate, the spathe valves lanceolate, rather long. Thus, it is certain that the plant at present recognized as *Lycoris aurea* is correctly identified. The reader should refer to Plate 313, *Lycoris aurea*, in Herbertia 14: 183. 1947 (1948). For the distinction between *Lycoris aurea* and *L. traubii* Hayward, the reader should refer to Hayward's article in PLANT LIFE 13: 40—42, fig. 13, 1957.

CRINUM CLONE 'CECIL HOUDYSHEL'

L. S. Hannibal, *Fair Oaks, Calif.*

According to Herbertia, Volume 2, page 111, *Crinum* x *powellii* 'Cecil Houdyshel' is apparently a *C. Bulbispermum roseum* x *C. moorei* cross. Crosses made by Major Pam and the writer using *C. b. roseum* have never duplicated the Cecil Houdyshel cross, and it was not until some *Crinodonna* hybrids and *C. americanum* hybrids were flowered where *C.* 'Cecil Houdyshel' was the pollen parent that we began to wonder just what was involved in the parentage of *C.* 'Cecil Houdyshel'. The reason for this reaction is that these secondary hybrids are either pure white or as deep a red as in several *Scabrum* crosses. Normally we would expect a dilution of the color gene, but this vividness appears to exceed anything which might come out of *C. bulbispermum roseum*.

At the moment we are wondering if Mr. Cecil Houdyshel used a *scabrum* x *moorei* pollen hybrid on *C. bulbispermum album*. This would explain the vivid color of *C.* 'Cecil Houdyshel' and the breeding behavior of the seedlings where it is a pollen parent.

As most *Crinum* fanciers know *C.* 'Cecil Houdyshel' selfs with considerable difficulty and the seedlings are weak, but it will often take other pollens such as those of *powelli album* or that of various species such as *C. bulbispermum album*. The writer's white-flowered *Crinodonna* is one of the most free flowering forms so far encountered and the form is very good. The tentative name is 'Grace'.

1965 DAYLILY REPORT

W. Quinn Buck, *Chairman, Daylily Committee*

Greater interest in pinks and the lavenders and blues, and a better acceptance of the tetraploid daylilies as a real horticultural advancement may be said to characterize the year 1965. A few notes are given here in the hope of reflecting these developments:

One of the brightest of the new diploid pinks in my garden was 'Zadol' (Spalding), the color having a glow unmarred by any admixture of salmon; one had to marvel each morning at the freshness of its color. Of even better shape was 'Pink Fluff' (Spalding), which had a blended color tone. 'Edna Spalding', named for its originator, was an outstandingly beautiful pale pink of exquisite texture, and now an induced tetraploid form of this clone is reported as being even finer. 'Pink Superior' (Fay) also was a really fine pale pink and it repeated vigorously. This reblooming characteristic, one of Mr. Fay's important goals, was displayed by a small summer-planted division of 'Pink Venus', which was sending up a second spike before the first was finished; it is hoped that the color quality will improve as this clone becomes better established. The clear color of the lavender-pink bi-tone 'Grace Lenington' (Lenington) was refreshing on a small new plant.

Other large pinks that made a good show were 'Peach Petal' (Lester), 'Almond Pink' (Hardy), and 'Exotic Lady' (Childs); the

latter repeated strongly and beautifully. The florid pink blend 'Buddy' (Claar) was adversely affected by nights too cool for it; the real beauty of 'Annie Welch' (Claar) was not apparent until our warmest nights had come, and then it was a marvel in spite of its somewhat sprawling scapes.

For real lavender color 1965 honors must go to 'Lavender Flight' (Spalding), which was a larger and better finished flower than most clones in its class. For clean bluish color we must admire 'Lavender Touch' (Childs), but it did not rival the earlier brightness of 'Blue Jay' (Spalding), which continues to be one of the fine clones. The Kennedy 55-54C had no peer for blue-purple color. A new seedling 65D1 (Buck) was a real joy in its deep rose-magenta self color, which

Fig. 14. **Hemerocallis washingtonia** clone 'California Duchess', brighter barium yellow.

promises much for the breeding of lavenders. 'Wannetta' (Spalding) was a delightful miniature of bright lavender-purple that was most outstanding in color quality.

'Emperor's Robe' (Fay) was a huge flower, very fine, but in my inland California garden it was certainly more pink than lavender. Likewise, 'Ruffled Star' (Fay) had little of the lavender in its blended color; it and 'Breaking Dawn' (Fay) were very large and quite outstanding pink blends.

Among the melons 'Louise Simon' (MacMillan) was again unchallenged among the early ones—if at all. 'Mildred O'Neal' (Kraus) was a most beautiful new melon with rounded form, and 'Hopewell' (Kraus) had a deep apricot melon flower with great substance. 'Far East' (Fay) proved to be a vigorous, reblooming large orange melon of superior

bright quality. The new 'Christine Ann' (Fay) was a lovely firm-textured melon among the very late ones.

'Ruffled Wax' (Fay) was well named, having unparalleled substance among the new yellows; it was lacking in distinction of form, however. Beautiful form and ruffling and ample substance characterized the flowers on the wonderfully branched spikes of 'Carl Milliken' (Hager), which rebloomed vigorously and was in every way a worthy tribute to the late hybridizer.

Among the tetraploids it is difficult to single out any individual clones for mention because few reports have been received. From E. W. Brown III of Orange, Texas, comes word of two outstanding seedlings out of the Crestwood lines: TS-6-65P is a beautiful eyed, clear pink in his Kodachrome of it, and T-6-65R is a handsome green-throated, eyed rose. Dr. Virginia Peck has a most outstandingly fine melon in her induced T-1-65, which is incredibly round and ruffled.

One of the fine textured tetraploids is 'California Duchess' (Traub) which is a subtle barium yellow in color and perfectly rain and sunproof; and is recurrent blooming. (Fig. 14)

The many visitors who saw the Fay-Griesbach tetraploids in 1964 have had much to do with the more favorable acceptance that begins to be evidenced in 1965. Still more visitors saw this planting in 1965, but the reports are that the seedling tetraploids, mainly of the Crestwood line, in the Mission Gardens fields in Techny, Ill., were the real eye-openers for the many visitors who went to see Brother Charles's work.—*26 E. Camino Real, Arcadia, Calif.*

THE CHROMOSOMES OF RAUHIA PERUVIANA TRAUB

Walter S. Flory,

Wake Forest College

The genus *Rauhia*, and its single known species *R. peruviana*, were both described by H. P. Traub in 1957. Dr. Traub has sent the writer a bulb of Clone A, and also a bulb of Clone B of this species for cytological study. The present article deals chiefly with the chromosomes of Clone B of *R. peruviana*.

The somatic chromosome number of this species is 46, this number having been seen clearly in eight different metaphase divisions of root tips from the single small bulb available. All divisions exhibited essentially the same chromosome types. Figure 15 shows one of these divisions from a root tip treated in .2 per cent colchicine for 5 hours, followed by alcohol: acetic acid, 3:1, fixation overnight and squashing in aceto-orecin solution. The drawing was made with a camera-lucida at a table magnification of approximately X2500.

When root tips are pretreated in colchicine for several hours the chromosomes are considerably contracted. Also, following this treat-

ment, the chromatids of the divided metaphase chromosomes remain loosely together for some time after they normally would have separated. This condition was quite apparent in our preparations, and is apparent in the accompanying drawing (Fig. 15).

THE CHROMOSOMES OF CLONE B

Four types of chromosomes occur in our bulb of Clone B. These types, with the number of each type, sizes of each type following the colchicine treatment, and the size range of each type, will be briefly described.

There are three long chromosomes with median, or near-median,

Fig. 15. Chromosomes of **Rauhia peruviana**, 2n = 46. Camera lucida drawing at X2500; reduced by about 15% in reproduction.

centromeric constrictions, each approximately 11 microns in length. In each, one arm is slightly over 5 microns, one arm is slightly less than 5 microns, and the centromere constriction space is approximately one micron in length.

There are 19 shorter submedian chromosomes, with several of these approaching the subterminal condition, ranging from just a little over 7 microns to—in one pair—just under 4 microns in length. The long arms of these chromosomes are approximately twice the length of their short arms. In this group there are 5 chromosomes which are 7 microns, or just a little more, in length, there are two, as mentioned, which are slightly less than 4 microns long, four which are 4 microns long, with

the remainder varying—in pairs—from more than 4 up to almost 7 microns in length.

The remaining two chromosomes comprise a fourth type since they are terminally constricted ones about 4 microns in length. This means they are approximately the same length as the shorter arms of the long, almost medianly constricted, chromosomes. Also, they are about the same length as the long arms of the longest chromosomes of the submedian group.

It has been pointed out that there are three long chromosomes with approximately median constrictions, and that there are five chromosomes each about 7 microns in length in the group with submedian attachment constrictions. The two terminal chromosomes appear to be the same length and would seem at first glance to be members of a pair. Considering the odd numbers of long median, and of long submedian, chromosomes—together with the similarity of length of short arm in the one, and of long arm in the other—it seems plausible that the two terminal chromosomes encountered here are actually the remnants of single fractured chromosomes of two different pairs. If such is true, the short arm of a long chromosome has been lost in one case, while the long arm of a shorter chromosome was also lost. If this is a true picture of events leading up to the presently observed and described karyotype, the observed karyotype would apparently have been derived from one in which only three types of chromosomes occurred. These types, with the numbers of each would be: (1) long median, or near-median, chromosomes—4; (2) short sub-median—20; and (3) short median, or near-median—22.

THE CHROMOSOMES OF CLONE A

Soon after receipt of the two *Rauhia* bulbs, cytological squashes were made of root tips of the Clone A one. Original observations indicated that there were 48, or approximately 48, somatic chromosomes in this accession. The bulb was lost before additional studies could be made of Clone A material. It is possible that this Clone (1) does have two more chromosomes than Clone B; (2) that the original tentative counts were in error and that this Clone also has 46 somatic chromosomes; or (3) that some other situation exists in Clone A.

If additional material becomes available the chromosome set-up in this Clone will be studied further.

BASIC CHROMOSOME NUMBER

Traub (1957) originally placed *Rauhia* in Tribe Pancratieae, along with *Chlidanthus*, *Pancratium* and *Stenomesson*. In a more recent treatment (Traub, 1963) he places *Rauhia* in his Tribe Stenomesseae, with *Chlidanthus*, *Pamianthe*, *Paramongaia* and *Stenomesson*.

Chromosome numbers are found in the literature for only two species in Tribe Stenomesseae. La Cour (1956) reported *Pamianthe peruviana* to have 2n=46, while Mookerjea (1955) found 2n to be 20 in *Chlidanthus fragrans*.

A number of years ago the present writer found *Stenomesson variegatum* to have 70 ± somatic chromosomes. The possibility exists that in this species 2n may be 69, or a number derived from 69.

It thus appears that 23 is a base number in the genera *Rauhia*, *Pamianthe*, and possibly *Stenomesson*, of Tribe Stenomesseae. Just how *Chlidanthus fragrans*, with 2n=20, relates cytologically to the three genera just mentioned appears problematical, as yet.

It seems of interest that considerable unpublished data on the chromosomes of *Hymenocallis*, of the closely related Tribe Eucharieae, points to 23 as being an important base number in this genus.

SUMMARY

Rauhia peruviana (Clone B, from H. P. Traub) has 46 somatic chromosomes in the single bulb studied. These may be classified as: long, median constrictions—3; shorter, submedian—19; short, median—22; terminal constrictions—2. One of the chromosomes with terminal constriction may be the short arm of an originally long, median chromosome; while the similar element may be the long arm of a shorter, originally submedian chromosome. The base number appears to be 23.

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NERINE UNDULATA

L. S. Hannibal, *4008 Villa Ct., Fair Oaks, Calif.*

Some years ago the writer received some very small hardy *Nerine* bulbs from Harrison's in New Zealand with the suggestion that they be properly identified. The foliage resembled that of *N. sarniensis* only it was only about six mm. wide and equally dwarf in other proportions. The scapes were about 15 inches high and 3 or 4 mm in diameter, and the blossoms were mere spidery filaments with the tepals some 3.5 to 4 cm. long by 1½ to 2 mm. wide and rather well crisped. Some similarities to *Bowdenni* were noted, especially in seeding habits. It was found that the two would readily cross, despite the great difference in size. The resulting hybrids are both summer and winter growing and are as hardy as *N. bowdenii* or *N. humilis*.

Eventually through the cooperation of Dr. J. W. van der Walt bulbs were submitted to Bolus Herbarium and Miss Verdoorn has confirmed that these are definitely *N. undulata* (see Fig. 16). As a result we can report that *N. undulata*, *N. flexuosa* and *N. bowdenii* belong to the same alliance as it appears that all of their crosses are fairly vigorous and quite fertile. As a garden flower *N. undulata* is entirely too whispy to indicate its presence.

CRINUM CLONE 'GULF PRIDE'

L. S. Hannibal, *4008 Villa Court, Fair Oaks, Calif.*

A year or so back Dr. Thaddus Howard sent the writer a *Crinum* bulb labeled *C. Kunthianum* which was described as having rather fragrant waxy-like blossoms that tended to droop in warm weather. When the plant flowered here it was obviously not *C. Kunthianum* Roem., as the latter has long rayed tepalsegs which places the plant in the class with *C. americanum*, except that *C. Kunthianum* blossoms are generally colored a wine pink.

Fig. 16. **Nerine undulata,** grown by L. S. Hannibal, Fair Oaks, Calif.

In searching the literature I came across a hybrid listed by L. H. Bailey in the Cyclopedia of Horticulture as *C. Kunthianum* Hort. non Roem., which is given as a cross of *C. Bulbispermum* and *C. Scabrum*. Since the original bulb had come from Lakemont Gardens I am rather inclined to believe that Dr. Howard's contribution was this same clone that Bailey describes. In comparing the plant to several other *C. Bulbispermum* hybrids it is rather obvious from the foliage that it is a *Bulbi* termin if the other parent was *C. Scabrum* or *C. Kirkii*. The trumpet shaped blossoms are a waxy pink-white with the general concentration of the pink pigment along the keel of the tepalsegs. Such a waxy texture and coloring could be derived from either of the latter species. The plant has been reportedly sterile as it sets no seed but we have found

CRINUM CLONE 'GULF PRIDE'—continued on page 70.

CRINUM FLACCIDUM CLONE 'WILLIAM MORRIS'

HAMILTON P. TRAUB

Mr. William Morris of Cairns, Queensland, Australia, has sent to us many bulbs of *Crinum flaccidum* which is a very variable species. The tepalsegs of the flowers in most of the plants are narrowly ovate-

Fig. 17. Crinum flaccidum clone 'William Morris': collected in the wild in Australia by William Morris, Cairns, Queensland.

acute, but in one clone, the tepalsegs are more broadly ovate. The setsegs are broadly-ovate, acute, and the petsegs are ovate, with apexes rounded, thus producing an imbricated effect (see Fig. 17). This outstanding plant was chosen from a large lot as the very finest for decorative purposes, and has been named 'William Morris' (Specimen No. 1000a+b

Fig. 18. **Lycoris albifora** (?) as flowered at La Jolla, Calif. in 1965.

Fig. 19. **Lycoris joséphinae** as flowered at La Jolla, Calif. in 1965.

(TRA), collected by Mr. Morris) for Mr. Morris of Australia who kindly sent a wealth of amaryllids to us. An attempt will be made to propagate this clone vegetatively.

THREE LITTLE KNOWN LYCORIS

Hamilton P. Traub

The purpose of the present brief note is to report on the blooming of three relatively little known *Lycoris* species, *L. alliflora* (?), *L. josephinae* and *L. koreana* (?). The writer used his Fotron camera in photographing the plants in flower.

Fig. 20. Lycoris koreana (?) as flowered at La Jolla, Calif., in 1965.

Lycoris albiflora (?)

In 1958, Mr. Sam Caldwell sent us a tiny bulblet labeled "Lycoris albiflora". This plant had continually declined at Nashville over a num-

ber of years. Apparently, the climate was not favorable for its growth there. The bulblet was set out in the garden at La Jolla, and it very gradually recovered over the years, and to our surprise, after seven years, it bloomed on August 28, 1965. It turned out to be a very beautiful species. The umbel was 7-flowered, and the flowers were assurgent (see Fig. 18), slightly pinkish in bud, opening creamy-white, very slightly tinged or streaked pinkish, maturing to solid creamy-white, with deeper creamy band in the center of the segs; the stamens and style were very slightly tinged pinkish (specimen #1012(TRA), 8-28-65). A comparison of the original description of Koidzumi (see Traub & Moldk. Amaryllidac.; Amaryll. 1949, p. 178), which is incomplete in some details, shows that it comes near to that species, and may actually be this species. However, it is not white, but creamy-white and apparently Koidzumi was careless in indicating the flower color.

Lycoris josephinae

This species bloomed in 1964 and again in 1965. The bulbs were collected originally by Miss Josephine Henry in China as indicated in Plant Life 21: 63—64. 1965). It differs from the ordinary self-fertile *Lycoris radiata* var. *radiata* in having stouter scapes, and in blooming later (late August through mid-September), and in having Delft rose-colored flowers. The umbel is 8-flowered. See Fig. 19.

Lycoris Koreana (?)

In 1964, Mr. Goedert sent us some bulbs labeled "Lyoris Vermilion" which he had imported from Japan. These were set out in the garden, and made good foliage during the winter. In late August 1965, flowers were obtained. See Fig. 20. A comparison of this plant (specimen #1011 (TRA), 8-28-65) with the description given by Nakai (see Traub & Moldk., Amaryllidac.: Tribe Amaryll. 1949, p. 176) shows that it comes near to that species. The flower color is a light brick-red (which the Japanese grower had almost correctly indicated as vermilion). The umbel is 7-flowered, the segs are quite regular, not twisted and crisped. Thus this may actually be *Lycoris koreana*. However, further comparisons will be made during the 1966 flowering season.

FURTHER NOTES ON GETHYLLIS, KLINGIA APODOLIRION, HESSEA AND STRUMARIA

Roux Wilsenach, *Dept. of Botany, University of the Witwatersrand Johannesburg, South Africa*

In a recent paper (Wilsenach, 1965) chromosome numbers and idiograms were presented for *Gethyllis, Klingia, Apodolirion, Hessea* and *Strumaria*. As the cytology of these genera was previously unknown, it led to new ideas on the relationships and to a discussion in which the systems of Pax and Hoffmann (1930), Gouws (1949) and Hutchinson (1934) were criticized. Unfortunately "The Genera of Amaryllidaceae"

(Traub, 1963) was not available to the author then and in these brief notes the results presented recently (Wilsenach, 1965) will be related to the grouping of genera according to Traub (1963).

In my recent paper the close relationship between *Hessea* (and *Strumaria*) and *Nerine* was demonstrated and this meant that these genera should be included in one tribe. Gouws' subtribe *Amaryllidinae* is identical to Traub's tribe *Crineae*. It is suggested that *Hessea* and *Strumaria* should be included here and this will create a big tribe which will include the following genera: *Hessea, Strumaria, Nerine, Brunsvigia, Boöphone, Ammacharis, Cybistetes, Crinum* and *Carpolyza* should tentatively also be included here. The basic chromosome number of this tribe will be n=11, but a few species have 12 as the haploid number.

Traub's suggestion that *Apodolirion* and *Gethyllis* may be congeneric is fully supported by the cytological data presented. *Klingia* was separated by Traub from these, being tentatively placed in the tribe *Pancratieae*. This decision by Traub must have been based on the presence of a staminal cup in *Klingia*, but as Traub pointed out more evidence was required. The idiograms of *Gethyllis, Klingia* and *Apodolirion* were so surprisingly similar that it was suggested to sink the three genera, recognising only *Gethyllis* (Wilsenach, 1965).

As far as I know it is still unknown whether the fruit of *Klingia namaquensis* (there is only one species) is a berry, like the fruit of *Gethyllis* species. Hutchinson placed *Gethyllis* and *Apodolirion* in the tribe *Zephyranthcae* and this grouping is supported by cytological evidence since very few Amaryllids with inferior ovaries have retained the basic chromosome number of 6 as is the case in these plants.

In a brief note Traub (1965) modified his system in accordance with newer evidence (Wilsenach, 1965). He still separated the genera *Gethyllis* and *Klingia,* awaiting verification of fruit character referred to above. His tribe *Crineae* has been modified to accomodate also the genera *Hessea* and *Strumaria,* but he gave 6 and 11 as the haploid chromosome numbers of this tribe. In actual fact most genera and species have 11 as the haploid number, but n=6 has not been reported for any of the *Crineae.* Some have 12 as the haploid number.

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AMARYLLID NOTES, 1966

HAMILTON P. TRAUB

Eucrosia eucrosioides var. **rauhiana** (Traub) Traub, **comb. nov.**

syn. **Callipsyche eucrosioides** var. **rauhiana** Traub, in Plant Life 13: 61. 1957.

Pancratium centrale (Chev.) Traub, **err. "P. centralis"**

Plant Life 19: 59. 1963. Syn. **Mizonia centralis** Chev., in Rev. Bot. Appliq. 30: 626; 628, pl. 33 & 34. 1950.

Agapanthus africanus var. **henryae** Traub, **var. nov.**

Haec varietas a forma typica speciei floribus albis recedit.

Holotype (nomenifer): Traub #991 (TRA), June 18, 1965, grown at La Jolla, Calif.

This is a beautiful pure white variety, of the blue **Agapanthus africanus,** described from stock furnished by Mrs. Mary G. Henry, Gladwyne, Penna. It is very much worth growing in the garden in the South and in pot culture in the North.

Stenomesson moldenkei Traub, **sp. nov.** (Amaryllidac.)

Herba bulbosa; collo bulbi ca. 11 cm. longo, 1 cm. lato; foliis cum floribus sub ad anthesi productis lineari-acutis usque ad 33 cm. longis, 6—8 mm. latis; pedunculo usque ad 28 cm. alto; valvis spathae ab exemplari typico absentibus; umbella 4—6-flora; pedicellis inter se in longitudine variis 1.5—3 cm. longis; ovario sub anthesi 6 mm. longo; perigonia aurantiaco, ca. 4 cm. longo, apice segmentorum subviridi; tubo teplaorum usque ad 2.6 cm. longo, ad basin ca. 3 mm. lato, ad apicem usque ad 5 mm. dilatato; segmentis tepalorum 1.4 cm. longis, 6—7 mm. latis, elliptico-acutis; cyatho staminorum 7 mm. longo, inter filamenta microscopice irregulariterque emarginato; staminibus segmenta tepalorum subaequantibus; filamentis filiformibus 5 mm. longis; antheris 6 mm. longis; stylo staminibus paulo breviore; stigma capitato. Holotype: Ferreyra #6922 = #176 (TRA).

Eustephia latifolia (R. E. Fries) Traub, **comb. nov.** Syn.—**Eustephiopsis latifolia** R. E. Fries, in Act. Soc. Sci. Upsal. Ser. IV. 1: 164—165, pl. 8, figs. 12 & 13. 1905.

Eustephia speciosa (R. E. Fries) Traub, **comb. nov.** Syn.—**Eustephiopsis speciosa** R. E. Fries, l. c. 163-164, pl. 8, figs. 14 & 15. 1905.

Habranthus paxii Traub, **nom. nov.** Syn.—**Hippeastrum tubispathum** Pax, in Engl. Bot. Jahrb. 11: 329—330, pl. 7, fig. 9. 1890.

Eucrosia mirabilis (Bak.) Traub, **comb. nov.** Syn.—**Callipsyche mirabilis** in Saund. Refug. Bot. pl. 168. 1868-73.

Eucrosia aurantiaca (Bak.) Traub, **comb. nov.** Syn.—**Callipsyche aurantiaca** Bak., in Saund. Refug. Bot. pl. 167. 1868-73.

TRAUB—AMARYLLID NOTES, 1966, continued on page 5.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*
Mr. Edward F. Authement, *Registrar*
Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones. 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis*, *Lycoris*, *Brunsvigia*, *Clivia*, *Crinum*, *Hymenocallis*, and so on should be addressed to Mr. Edward F. Authement, *Registrar*, 2214 Gallier St., New Orleans, Louisiana 70117. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

CORRIGENDA

Plant Life, Vol. 21, 1965

Registration of New Amaryllis Clones

Page 51, line 8 from bottom, "G. C. Van Waveren & Sons" read "G. C. Van Meeuwen and Sons".
Page 98, line 23 from bottom, for "D-15A" read "D-5A".

NEW AMARYLLIS BREEDERS, 1965

Abbrev.

Forb.—Mrs. Sam Forbert, 1910 Evergreen Lane, Hattiesburg, Miss.
Stat.—Mrs. Ioma Staton, 1216 Roosevelt Ave., San Antonio, Tex.

AMARYLLIS CLONES REGISTERED IN 1965

EDWARD AUTHEMENT, *Registrar*

Registered by Robert D. Goedert, Jacksonville, Fla. for Harry de Leeuw Co., Ltd., South Africa.

'Redstone' (HDL—1964), R; A-823, D-5A; U-4fld; 12"h; fls. 5½" diam; dutch vermilion (HCC-717), darker shade in throat. I—Goed. 1964.

'Red Rover' (HDL—1964), R; A-824, D-5A; U-4fld; 10"h; fls. 6" diam; vermilion (HCC-18), faint white blotch in upper 3 segs. I—Goed. 1964.

'Red Hood' (HDL—1964), R; A-825, D-5A; U-4fld; 14"h; fls. 7" diam; scarlet (HCC-19). I—Goed. 1964.

'Vintage' (HDL—1964), R; A-826, D-5A; U-2-3fld; 17"h; fls. 7" diam; indian lake red (HCC-826). I—Goed. 1964.

Registered by G. C. Van Meeuwen & Sons, Heemstede, Holland

'Berenice' (VM—1964), R; A-827; D-5A; U-5fld; 18"h; fls. 7" diam; currant red (HCC-821) with velvety sheen; spr. dec.

'Daphne' (VM—1964), R; A-828, D-5A; U-4fld; 20"h; fls. 8" diam orient red (HCC-819), green to white midribs ¾ up segs, white pencil stripes each side midrib in upper 3 segs; spr, dec.

'Durango' (VM—1963), R; A-829, D-5A; U-4fld; 21"h; fls. 8" diam; signal red (HCC-719), cardinal red throat; spr. dec.

'Fortuna' (VM—1964), R; A-830, D-5A; U-4fld; 18"h; fls. 6-7" diam; poppy red (HHC-16/1), darker shade in throat; spr, dec.

'Hecuba' (VM—1963), R; A-831, D-5A U-3-4fld; 22"h; fls. 7" diam; mandarin red (HCC-17), darker shade in throat, green midrib on reverse side; spr, dec.

'Odin' (VM—1963), R; A-832, D-5A; U-4-6fld; 18"h; 7" diam; signal red with cardinal red ring in throat, creamish midrib; spr. dec.

'Orin' (VM—1964), R; A-833, D-5A; U-4fld; 25"h; fls. 9-10" diam; vermilion red (HCC-18) on white, white border around edge of all segs; spr. dec.

Registered by Mrs. Sam Forbert, 1910 Evergreen Lane, Hattiesburg, Miss.

'Lisa Forbert' (Forb.—1965), R; A-834, D-8; U-3-4fld; 18"h; fls. 4½" diam; chartreuse with picotee edge; spr.

'Shocking Pink' (Forb.—1965), R; A-841, D-5A; U-4fld; 18"h; fls. 8" diam; neyron rose (HCC-623/1), light green throat; spr.

Registered by Mrs. Paul A. Kane, 1001 McIlvaine St., San Antonio, Tex.

'Ioma Staton' (Stat.-1967), R; A-835, D-7; U-4fld; 22"h; fls. 7½" diam; scarlet (HCC-19), minute amount of white deep in throat. I—Kane, 1967.

Registered by Ludwig & Co., Hillegom, Holland.

'Front Page' (Lud.-1965), R; A-836, D-5A; U-4fld; 26/28"h; fls. 7/9" diam; scarlet (HCC.-19) with bloodred throat; spr.

'Gipsy Giant' (Lud.-1965), R; A-837, D-5B; U-4fld; 30"h; fls. 8/9" diam; with white suffused with salmon pink and distinct white star in throat; spr.

'Scarlatto' (Lud.-1965), R; A-838, D-5B; U-4fld; 26/28"h; fls. 7/9" scarlet (HCC-19) with bloodred throat; spr.

'Sparkling Gem' (Lud.-1965), R; A-839, D-8 (Gracilis); U-4/6fld; 20/24" h; fls. 3/4" diam; dark orient red, darker throat; spr.

'White Witch' (Lud.-1965), R; A-840, D-5B; U-4fld; 23/25"h; fls. 9/10" diam; white with applegreen throat; spr.

Registered by Mrs. Sam Forbert, 1910 Evergreen Lane, Hattiesburg, Miss.

'Leslie Forbert' (Forb. 1965), R; A-842, D-5A; U-4fld; 18"h; fls. 8" diam; camelia rose with scarlet throat; spr.

CRINODONNA CLONE

Introduced by Mrs. Polly Anderson, 1810 Palm Drive, La Canada, Calif. 'Raspberrg Ice', Flowers drooping, a deep raspberry color, open faced, 7-15 flowers per umbel; scape 4ft. tall; October to December.

PROCEDURE FOR STAGING AMARYLLIS SHOWS

EDWARD F. AUTHEMENT, *Registrar*

There seems to be a great deal of confusion and misunderstanding regarding the staging of official Amaryllis shows. The Men's Amaryllis Club of New Orleans, Inc. and The Garden Circle Amaryllis Club of New Orleans have been staging shows every spring for the past several years. With the help of Mrs. W. D. Morton, Jr., and after her passing, Mr. Morton, a certain procedure of the entire operation with less confusion and a more simplified method has gradually evolved. The following is submitted here with the hope it may be of some help to Amaryllis Clubs who stage official shows.

First, of course, the club must decide if it will stage an Amaryllis show and set the date. This must be decided early (Oct. or Nov.) in order that the show committee has ample time to make up the show schedule and appoint the various committees for the show. The Club's President then appoints the show chairman. With the help of past presidents and Show Chairmen, the new Chairman appoints the various committees who will be responsible for staging the show.

The most important of these, of course, is the classification committee. This committee should be the first to approve or reject the entries. It must also mark the entries as to flower division and correct name of the clone or species. The committee should consist of at least three members who are well familiar with the specimens likely to be offered for exhibit. This committee may also mark the entry as to their proper placement on the exhibit tables.

The registration committee has the task of filling the registration cards with the exhibitor's name, address, phone number and name of the clone or species being entered.

The placement committee is charged with the placing of the exhibits in their proper place on the tables. The exhibitor should never be allowed to bring specimens on the floor of the show room at any time. This is better done by the placement committee.

The publicity committee has the task of writing up the results of the show immediately after judging, for publication in the local newspaper.

The chairman of judges must contact the Amaryllis Judges for the show and advise them of the date and time for judging. The chairman also instructs the judges as to the various sections and their location on the floor. If special awards are to be made, the judges are so instructed and asked to designate the variety winning the award.

The duties of Hospitality is to provide refreshments for the judges and entertain prominent visitors.

The properties committee must see to it that all the necessary items used at the show are provided for. The arranging of the exhibit tables, the necessary identifying cards for sections and exhibits, and the general set up of the show is the job of all the club members. This is generally supervised by the show chairman or the co-chairman.

The chairman of clerks is responsible for instructing the clerks as to their duties in helping the judges and general supervision of the clerks while judging is taking place.

The show standards chairman is the go-between member who reports the results of the show to the Editor of the Amaryllis Year Book and interpreting the show rules as set forth by the American Amaryllis Society.

There are two arrangement choices by which an Official Amaryllis Show can be conducted. *First* is by *Flower division* and *color values*. This is by far the more simple method and less complicated. It was the method used before World War Two. The specimens are exhibited according to flower division and color values. The grower or country of origin is disregarded.

The *second* choice is by staging the exhibits as *Dutch* and *American* clones. The specimens are then separated according to the Amaryllis flower division and clones. The clones govern the color values and are separated as such. The species are always exhibited in one group, separated by color, with identifying cards.

In the second method, confusion is always the case when trying to distinguish between the Dutch and American clones. Hybridizing in this country and elsewhere has progressed to the extent that Amaryllis from all over the world can compete favorably with the Dutch clones. This method was allowed by the American Amaryllis Society after the second World War because the Dutch Amaryllis and American clones were the main ones on the market. It was always hoped by the Society that the various Amaryllis clubs who stage shows would go back to the pre-war method when sufficient clones were available.

The Garden Circle Amaryllis Club of New Orleans have staged their show since 1963 according to *flower division* and color values and growers. The Houston Amaryllis Society, Houston, Texas, have been staging shows for the past eight years, according to the Amaryllis flower division and color values. There are probably other clubs who do the same. Both of the clubs named above have found this method to be less complicated and easier. It also tends to be a more orderly show and permits fair competition by various growers.

The staging of Amaryllis Shows by the flower division and color values also minimizes the work of the judges. This is very important. The judges can do their work faster and are not hampered by exhibits of the same flower division being placed or scattered all over the floor. The judges are instructed to judge the individual exhibits according to the perfection of the flower and plant in each division. The point scoring is used by all Amaryllis judges and the country of origin makes no difference.

The following is an example of the schedule of the Men's Amaryllis Show of New Orleans for 1966.—Table 1.

Table 1. The Men's Amaryllis Club of New Orleans, Inc., 1966 Show Schedule.

All specimens must have three or more florets per scape to be eligible for entry in competition in any section.

POTTED PLANTS

SECTION I—REGISTERED AND NAMED

Division 2—Long Trumpet Hybrids	(D-2)	By name
Division 3—Belladonna Type Hybrids	(D-3)	By name
Division 4—Reginae Type Hybrids		
a—Markedly imbricated type	(D-4a)	By name
b—Less imbricated type	(D-4b)	By name
Division 5—Leopoldi Type Hybrids		
a—Markedly imbricated type	(D-5a)	By name
b—Less imbricated type	(D-5b)	By name
Division 6—Orchid-Flowering Hybrids	(D-6)	By name
Division 7—Double Hybrids	(D7)	By name
Division 8—Miniature Hybrids	(D-8)	By name
Division 9—Unclassified Hybrids	(D-9)	By name

SECTION II—UNREGISTERED AND UNNAMED (BREEDER'S)

Division 2—Long Trumpet Hybrids	(D-2)	By color
Division 3—Belladonna Type Hybrids	(D-3)	By color
Division 4—Reginae Type Hybrids		
a—Markedly imbricated type	(D-4a)	By color
b—Less imbricated type	(D-4b)	By color
Division 5—Leopoldi Type Hybrids		
a—Markedly imbricated type	(D-5a)	By color
b—Less imbricated type	(D-5b)	By color
Division 6—Orchid-Flowering Hybrids	(D-6)	By color
Division 7—Double Hybrids	(D-7)	By color
Division 8—Miniature Hybrids	(D-8)	By color
Division 9—Unclassified Hybrids	(D-9)	By color
SECTION III—A. Cultivated Wild Species	(D-1)	By name

SECTION IV—UNREGISTERED AND NAMED—Same standards as Section I

CUT SCAPE SPECIMENS

SECTION V—Same standards as Section I ..... By name
SECTION VI—Same standards as Section II ..... By color

SINGLE FLORET SPECIMENS

SECTION VII—Registered and named specimens only ..... By name (Competition in this section open only to members of the Mens Amaryllis Club of New Orleans, Inc.).

ARRANGEMENTS FEATURING AMARYLLIS ..... According to theme

AWARDS

The usual Ribbons—1st, 2nd, 3rd and honorable mention—will be awarded in sections I, II, III, V, and VI.

Tri-Color Ribbons—to be awarded to the outstanding specimen in Section I and Section II.

Sweepstakes Ribbons to be awarded, one each for most blue ribbons in Section I and Section II.

American Plant Life Society Awards of Merit and Preliminary Commendations to be awarded in accordance with rules of that society to meritorious specimens in Sections I, II, V and VI, as warranted.

CUPS—Gold Cup to Tri-color winner of Section I (Jessee)
Gold Cup to Tri-color winner of Section II (Rose Garden Center)
Silver Cup to Sweepstakes winner of Section I (Swetman)
Gold Cup to Sweepstakes winner of Section II (Reuter)
Gold Cup for most blue ribbons won in Sections I, II, III, V and VI together by a member of Men's Amaryllis Club of New Orleans, Inc.
Silver Tray to winner of most blue ribbons in Sections I and V (Swetman)
Gold Cup to best home-bred, grown and developed Amaryllis entered in either Section I or Section II (Alatex)

The following is an example of a schedule permitted after the second World War and used by the Men's Club in the past:

Horticulture

Section 1

Class 1 Named Dutch Hybrids (Registered)
Class 2 Named Dutch Hybrids (Unregistered)
Class 3 Unnamed Dutch Hybrids (By Color)
Class 4 Dutch Seedlings, First Year Bloom
Class 5 Dutch Seedlings, Later Bloom

Section 2

Class 1 Named American Hybrids (Registered)
Class 2 Named American Hybrids (Unregistered)
Class 3 Unnamed American Hybrids (By Color)
Class 4 American Seedlings, First Year Bloom
Class 5 American Seedlings, Later Bloom

Section 3

Class 1 Double Hybrids
Class 2 Miniatures or Dwarf—Dutch Hybrids
Class 3 Miniatures or Dwarf—American Hybrids
Class 4 Miniatures or Dwarf—Double Hybrids
Class 5 Any Species. This includes **A. x johnsonii.**

In conclusion, we wish to point out to the Amaryllis Clubs that the physical set-up of the exhibits on the show floor is entirely up to the Show Committee. However, every effort should be made to make the work of the judges as easy as possible.

HERBERT'S "AMARYLLIDACEAE" (1837) REPRINTED

The firm, Verlag von Cramer, 694 Wienheim, Germany, will reprint Herbert's "Amaryllidaceae" (1837), with an introduction by H. P. Traub, in 1966. The many who have wanted a copy of this classic are now given the opportunity of obtaining this classic. The pre-publication or subscription price is $30.00; after publication, the price is $40.00. Send orders directly to the publisher.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Section *Eutulbaghia*, genus *Tulbaghia*, Baker, J. Linn. Soc. Bot. 11: 370. 1871. Stamens fleshy, grown together with the corona, rarely almost free; staminodes deeply emarginate, free or connate only at the base (*capensis*) [or] grown together with an entire or crenate corona; corona 2—3.2 mm. high; leaves fleshy-herbaceous, 4.2—6.2 mm. wide or even wider (*alliacea*) [or] firm, filiform, 1.1—2.1 mm. wide (*acutiloba*); [or] corona 1.1 mm. high; perianth-segments obtuse, scarcely surpassing the corona (*dregeana*); [or] segments linear, 4—6 times as long as the corona (*hypoxides*).

Section Omentaria, genus Tulbaghia, Baker, J. Linn. Soc. Bot. 11: 370. 1871. Staminodes small, strap-shaped, all free from each other; leaves 1.1—2.1 mm. wide; perianth 1.1—1.3 cm. long (*cepacea*) [or] leaves 4.2—6.3 mm. wide; perianth 1.7—1.9 cm. long (*violacea*).

Pancratium parviflorum J. Decaisne, in Ann. Sci. Nat. Ser. II. Bot. 4: 346. 1835. Scape slender; umbel many-flowered, perianth-segments oblong-lanceolate, green on the back, fleshy-apiculate; the segments [divisionals] of the corona subequaling the filaments; anthera ovate; style surpassing the stamens; ovary ovate-globose.

Subtribe *Miluleae (Milulinae)*, Prain, tribe Allieae; in Ann. Roy. Bot. Gard., Calcutta 5(2): 164. 1896. Bulb tunicated; spike terminating a simple leafless scape; bract 1, membranous, beneath the spike; bracteoles none; perianth gamophyllous; androecium regular; capsule loculicidally dehiscent.

Genus *Milula* Prain, Subtribe *Milulinae* Prain, tribe *Allieae:* in Ann. Roy. Bot. Gard., Calcutta 5(2): 164—165. 1896. Bulb tunicated; leaves strap-shaped; inflorescence spicate, covered by a solitary membranous bract; perianth gamophyllous, 6-parted, the lobes rounded; stamens shortly epiphyllous, 6, opposite the petals; ovary syncarpous, 3-celled; style simple, filiform; ovules 2 in each cell; capsule loculicidally dehiscent; seeds 2 or 3; testa corrugated and very minutely punctulate.

Milula spicata Prain, in Ann. Roy. Bot Gard. Calcutta 5(2): 165. 1896. Bulk leek-colored, 4—7 cm. long, the scales fibrous, 2.5—3.5 cm. long, the roots 4—5 cm. long; leaves green, 10—15 cm. long, 3.3—5 mm. wide; scape green, free, 6—9 cm. long, 2.5—3.3 mm. thick; spike 2—5 cm. long, 1 cm. in diameter; bract 3 cm. long and 2 cm. wide; florets 2.5 mm. wide, the perianth 2.5 mm. long, the filaments 4—5 mm. long; ovary 1.5 mm. in diameter; style 2 mm. long; stigma very small, capsule slender, 3 mm. wide; seeds 2.5 mm. long, 1.5 mm. in diameter.

CRINUM CLONE 'GULF PRIDE'—continued from page 56.

that its pollen will strike quite readily on *C. Bulbispermum, C.* x 'Ceeil Houdyshel'' and *C. americanum.* Thus *if it will* strike on *C. Scabrum* and give backcross hybrids closely resembling *scabrum* we could confirm the cross.

Since the hybrid is definitely not *C. Kunthianum* we propose the garden name of 'Gulf Pride' since it is fairly wide spread in the south, a very good garden subject, and fairly hardy. And above all has a very well formed umbel of blossoms that are excellent for cutting and display purposes. We feel that the proposed garden name is well justified.

At this time we cannot determine if 'Gulf Pride' is the same clone as *C.* x *herbertii,* a cross between *bulbispermum* and *C. scabrum* which is described on page 273 of Dean William Herberts fascinating publication of 1837. Herbert presumably effected his cross sometime around 1815. Dr. Thaddus Howard has effected several similar crosses. His recently named hybrid *C.* x 'Thaddus Howard' is quite an outstanding plant for the form, quality and color of its near rose blossoms. The latter plant is much hardier than 'Gulf Pride'.

PLANT LIFE LIBRARY—continued from page 24.

PHYLOGENY AND FORM IN THE PLANT KINGDOM, by H. J. Dittmer. D. Van Nostrand Co., 120 Alexander St., Princeton, New Jersey. 1964. Pp. 642. Illus. This attractive book was designed "not only for the college student interested in continued work in botany, but also for the nonprofessional who may want a terminal course in this field. The term "plant kingdom" is used in a wide sense to include (1) the bacteria (Schizomycophyta) plus Blue-green algae (Cyanophyta); (2) the aglae; (3) the fungi (Myxomycophyta and Eumycophyta); (4) the Bryophyta; and (5) the vascular plants (Tracheophyta). In the text each topic is adequately illustrated and discussed. This stimulating text is highly recommended.

THE NATURE OF THE NATURAL SCIENCES, by Leonard K. Nash. Little, Brown & Co., 34 Beacon St., Boston 6, Mass. 1963. Pp. 406. Illus. $6.50. This is among the outstanding texts on the philosophy of science. The subject is presented in all its aspects in the context of actual events in the history of science. The book is concisely written in easily readable English. The chapter headings are: common sense (and science); science (and common sense); the anatomy of science; cosmology and technology; colligative relations and scientific laws; empirical tools and empiricism; the principles of science; theories and models; the evolution of scientific theories; organized science; creative science; and the real world. If a person could have only one text on the philosophy of science, this is the one which should be chosen. Highly recommended.

THE PHOTOCHEMICAL ORIGIN OF LIFE, by A. Dauvillier. Academic Press, 111 5th Av., New York, N. Y. 10003. 1965. Pp. 193. Illus. $7.50. We are indebted to Scripta Technica, Inc., for this fine translation into English. Prof. Dauvillier explains his ideas on the origin of life as an interdisciplinary subject of cosmic physics involving astronomy, geophysics and geochemistry. He emphasizes the role of paleovulcanism in bringing about the pyrogenetic synthesis of numerous heterocyclic compounds; and suggests that after condensation of the oceans, photochemical reactions occurred with the capacity of creating the optical rotation characteristic of living matter. This stimulating text is highly recommended.

PLANT LIFE LIBRARY—continued on page 110.

3. GENETICS AND BREEDING

ENJOYING AMARYLLIS THE YEAR 'ROUND

V. Roger Fesmire,

16938 Elgar Ave., Torrance, Calif. 90504

In a previous article in the 1963 Year Book, there was outlined a 3-point program which I intended to follow in an attempt to secure flowers the year around in a small greenhouse in Colorado. Some results can now be reported, particularly under the first point of the program: careful bulb management.

There is no doubt that all *Amaryllis* bulbs, even species and evergreen types, require a definite resting period before blooming. I have noticed that even bulbs being raised from seed will take a rest, when they seem to stand still, before sending up their first flower scapes. When bulbs are grown in flower pots, it is possible to manipulate this resting period to a certain extent. By beginning the rest period of different bulbs in different months, I found it was possible to spread out the blooming season over a much longer period of time. In 1962, most of my bulbs bloomed, in the greenhouse, during February and March. By 1964, the main blooming season had been spread out over four months, with some flowers during eleven months of the year. It should be noted that some bulbs are very easy to handle in this way, particularly those with *Amaryllis striata* genes in their immediate ancestry, while others will persist in blooming late in the spring regardless of when their rest period is begun, and some are always quite unpredictable in their behavior.

In the previous article, a reference was also made to the orange-scarlet Houdyshel hybrids, which I had purchased under the name of "Rutila hybrids." These evidently do have some *Amaryllis striata* genes in their ancestry as Mr. Houdyshel believed, for they are very easy to bring into bloom at different times. I have had flowers from them in eight different months of the year. They also resemble *A. Striata* in their tendency to decay about the neck of the bulb; planting the entire bulb below the soil level helps to prevent this condition. Although I found it difficult to secure a self-cross with these bulbs, one was finally successful. The first seedlings have just bloomed (July, 1965), and the flowers are almost identical with the Houdyshel hybrids, indicating this strain is fairly well fixed. Both the original bulbs and the seedlings, however, resent being repotted or completely dried off, and resume growth again very reluctantly. When I moved from Denver to southern California about four months ago, I brought with me only two bulbs of the original Houdyshel hybrids, dried off and packed in bags, as were most of my other mature bulbs. All of the other bulbs, with one exception, have resumed growth again since being repotted, but not these two!

The Houdyshel hybrids were also crossed with *Amaryllis striata* var. *fulgida*, and the results so far have been quite a surprise. The

cross was made both ways, but the plants with *striata* as the pollen parent grew much faster and resemble more the Houdyshel hybrids in leaf characteristic than the plants with *striata* as the seed parent. The first seedling bloomed this past January in 4" pots in the greenhouse, but the flowers bore no resemblance to the Houdyshel hybrids. They did resemble very closely *A. striata* var. hana, in size, color, and scape height. The first seedling to bloom of the reverse cross is now sending up a flower bud, and since the plant resembles *A. striata* in leaf, I am very curious to see what type of flower it produces.

Most of my breeding work can be classified under the second point of my 3-point plan, which is to produce a strain of *Amaryllis* that will be recurrent in its blooming habits, and also small enough both in foliage and bulb size to be grown satisfactorily on a window sill in the house or in a small greenhouse. A number of plant breeders in the past have produced such hybrids, although their work has apparently been lost. Possibly some member of this society is even now growing such a type of *Amaryllis*, and if so, I would apreciate hearing about it.

Most work along this line in the past has apparently been done with *A. Striata*, var. *fulgida*, as one of the parents, since it is a recurrent bloomer. In my greenhouse in Colorado, this species bloomed every four to eight months, and so it has been used extensively in my program. Close to a hundred crosses involving this species have been made so far, and some have already bloomed, with gratifying results in respect to flowers, but only a few bulbs show definite promise of being recurrent in bloom habit. However, back-crosses and self-crosses have been made, and in these the recurrent-blooming trait will perhaps appear more frequently. In addition to these crosses, several crosses have been made between *A. Striata* and a miniature hybrid from India, which hybrid flowers regularly every six months. These seedlings have not yet reached blooming size, but I anticipate much from them. Many of the crosses have produced plants of small size, and so it is now evident that the most difficult part of the goal is to secure the recurrent-blooming habit. As an individual "bonus", growing *Amaryllis* from seed is another method of securing flowers all the year around, since bulbs grown from seed are likely to send up their first flower scape at any time of the year.

The third point of my program is to develop hybrids which will bloom naturally at other seasons of the year in addition to the spring season. This means going back to species which bloom at other seasons of the year for breeding stock. Here I have made but little progress, although such species and hybrids do exist. I have a considerable number of species growing, but few have bloomed thus far. Crosses involving *A. aulica* have not been successful, although four crosses involving *A. pardina* are now growing nicely. At the present time, a flower bud is showing on an *aulica* cross which I recently secured from an importer, and other species should bloom for me this fall. More material is being acquired steadily, and eventually I expect to report results along this line also.

SOME THOUGHTS ON NERINE HYBRIDS

EMMA D. MENNINGER, *California*

WHITE NERINES

Because of the dearth of pure white Nerines, both species and hybrids, I have attempted to hybridize a few of the white clones in our collection. From the Exbury Collection, we have 'King of the Belgians' X 'Pure White'; 'Snow'; 'Snowflake'; 'Solent Swan' and 'White', the latter sometimes has a faint tinge of pink. Of our own pure white hybrids, we have the following cultivars: 'Angel Wings'; 'Crystal Palace'; 'Denali'; 'Snow White' and a former clone 'Star White' which has since died, although we have two unflowered seedlings from it. For several years, I have isolated these white clones when in flower and have intercrossed them, not having the time to make specific crosses so that the pollen parent is known. Before this project, one of the earlier crosses with seed from the pure white 'Crystal Palace' disappointingly gave a pale pink hybrid.

Because of the scarcity of white species and hybrids, I suspect that white is recessive to pink and probably to other colors. There are reported to be two white sports of species, one of *bowdenii* and one of *sarniensis*. The former *bowdenii* var. *alba*, received an AM, RHS for Veitch on September 26, 1911. The *sarniensis* was reported by Mrs. Sina Eliofson in "South African Flowers for the Garden" as a pure white found on Table Mountain. The only other white species that I recollect is *Nerine pudica* which is white with pink median lines on the tepalsegs. or sometimes it is more or less pink. There is a good colored illustration of *N. pudica* in the Botanical Magazine, t. 5901. So far as I can ascertain the species *flexuosa* var. *alba* is pale pink, at least those in cultivation appear to be pink.

Besides the aforementioned white *Nerine* hybrids, there are three white cultivars listed in my "Catalog of Hybrid Nerine Clones" in the Amaryllis Yearbook for 1960. These are 'Candida', pure white, 'Snowdrift', good white and 'White Knight', the latter with pink median lines. 'Alice' the parent of the tetraploid 'Inchmery Kate' was said to be white with rose suffusion.

Whether any of the white species mentioned or the last four cultivars are in cultivation is unknown to me. It is interesting to speculate whether these white hybrids may have *N. pudica* in the background. These might include several whites with pink median lines on the tepalsegs that have appeared among our seedlings, the first of which was named 'Candystick'.

However, I am interested in securing more pure white hybrids. Hopefully, this season, a few may appear in our older seedlings with white seed parents, including a cross of 'Snowflake' ♀, a sibling of 'Snow White'; two of 'Star White' ♀ and a number of seedlings from 'Crystal Palace' ♀. Later white crosses are too small to flower.

The writer would be pleased to hear of any other pure white species or hybrids.

Table 1.
Royal Horticultural Society Awards to Hybrid Nerines, 1960–1964

NAME	TO	AWARD	DATE	DESCRIPTION
'Angela Limerick'	Clarke	AM	8/27/60	Bright Dutch vermilion
'Carolside'	de Rothschild	AM	9/11/60	Mandarin red (HCC 17/1) 'Rotherside' x 'Herga'
'Plymouth'	de Rothschild	AM	9/11/60	Claret rose (HCC 021) 'Joan' x 'Herga'
'Dorothy'	Clarke	PC	9/11/60	No description
'Norah Hamilton'	Clarke	PC	8/27/60	No description
'Nicholas'	de Rothschild	PC	9/25/60	No description
'Pamela'	de Rothschild	AM	9/25/60	Dawn pink (HCC 523/1) 'Aerolite' x 'Queen Mary'
'Susan'	de Rothschild	PC	9/24/61	[Very fine large light pink]
'Egryn'	de Rothschild	PC	9/24/61	No description

There appear to be no further awards through 1964.

ABBREVIATIONS

AM	Award of Merit
PC	Preliminary Certificate
Clarke	Sir Ralph Clarke, Borde Hill, Haywards Heath, Sussex, England
de Rothschild	Edmund de Rothschild, Exbury nr Southampton, Hampshire, England

MINIATURE NERINES

Hybrid miniature counterparts of well-loved larger flowers are now much in vogue and hybridizers are at work to fill this demand. Roses, Dahlias and Orchids are among those that are popular. In orchids, miniature Cymbidiums bred from the dwarf species such as *pumilum* and *ensifolium* are being raised by the thousands in Southern California and these are receiving as many or more awards than the standard Cymbidiums.

So far as I am aware miniature hybrids are practically unknown among Nerines. A species that offers promise in this direction, is *Nerine filifolia* with thread-like or chives-like leaves that with us are evergreen. Dainty pink flowers surmount the dark green foliage.

Dr. Hamilton P. Traub has made a beginning to correct this deficiency by crossing *filifolia* with pollen of the larger flowered hybrids and species. One of his hybrids of *filifolia* with 'Rosalba' flowered in two years from seed. This short period from seed to flowering and the fact that the seedlings are evergreen, gives much encouragement to continue this type of breeding. I am sure that we shall hear more of this interesting project.

No doubt there are other dwarf species than *filifolia*, such as *masoniorum*, that could produce miniature hybrids, but my knowledge of these is too meager to mention some that might qualify as good subjects for hybridization. Also, although the fertility between dwarf and larger species may be low, a few seedlings from each crossing will be worthwhile and it will be interesting to learn if these miniature hybrids will produce seed and if they can be back-crossed with the dwarf parents or other dwarf species.

This is only a hint of the fascinating possibilities in this line of breeding.

VIRUS DISEASES

A practically incurable disease of virus origin may infect Nerines. In some types, the leaves become streaked with lighter green or yellow

and the plant becomes stunted. I have noticed a few pots of Nerine hybrids with these symptoms. Some have been destroyed, preferably by burning, but a few others were sent to the virologists of the University of California for diagnosis. So far, I have had no report on these. Virus diseases of various types occur in many plants including Amaryllis and Orchids. It is spread by insect vectors, contaminated cutting tools and possibly reused stakes, etc. Dr. Traub in his book "The Amaryllis Manual", 1958 (p. 179) has an enlightening section on virus diseases of amaryllids. He mentions Dr. Georges M. Morel's (1955) proposed method of eradication of virus by culturing the apical growing point which is believed to be free of virus.

A few weeks ago, I met and talked with Dr. Morel and heard his lecture which was primarily devoted to the multiplication of callus tissue from the apical meristem of orchids by aseptic tissue culture to increase division of valuable clones. Dr. Morel was not sanguine regarding the eradication of virus by this method and I had the feeling that the method was, at least, somewhat disappointing. So it, therefore, behooves the grower to be alert and destroy suspected plants before the disease spreads to healthy ones.

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NERINES IN ENGLAND

J. T. Gallagher, *England*

The old adage about travel broadening the mind might equally well apply to our plants as to the eminent Victorians about to embark on the Grand Tour. Two examples immediately spring to mind, the extraordinary evolution of the Camellia since it emigrated from China and Japan to your Southern States and the *Nerine* which after a lengthy stay in England is only now returning to its native South Africa in a decidedly sophisticated form. Gilding the Nervine Lily began in the first quarter of the last century when Dean Herbert crossed *Nerine* species in order to obtain information for his treatise on the family Amaryllidaceae. It is fortunate that he used so many different species as his hybrids form the foundation of modern *Nerine* collections today.

His work was continued by H. J. Elwes, whose many hybrids are still in cultivation and although outmoded by newer clones, do contain some aneuploids and at least two triploids—'Lady Llewellyn' and 'Lady Sterling Maxwell'. After his death, half the Elwes collection was sold to Col. Stevenson-Clarke at Borde Hill in Sussex, where they still flower wonderfully each year cared for by Lady Clarke and her Head Gardener, Brian Doe.

Perhaps the most important collection is at Exbury near Southampton. It was built up by the late Mr. Lionel De Rothschild since 1930 who succeeded in breeding a remarkably wide range of different coloured

hybrids of excellent form and quality. I have been fortunate enough to visit the collection in flower for the past few years and am constantly surprised by the remarkably high standard of all the seedlings. What is even more astonishing is that the whole collection has been achieved by making only 130 odd crosses. Over 20 named hybrids, many given awards of merit and one a first class certificate by the Royal Horticultural Society, were obtained from one cross alone—'Aerolite x Lionel'. Even more fascinating is the fact that these seedlings range from the white with a crimson tip of 'Coronation' and white with the pale pink edge of 'Jocelyn', through the deep salmon of 'Nell Gwynn' to the claret coloured 'Nelson'. I have both 'Aerolite' and 'Lionel' in my own collection and last Autumn with the help and guidance of Mr. LaCour, the eminent cytologist at the John Innes Institute, carried out a chromosome count on active root tips of 'Aerolite', only to find that it was a diploid (2n=22). Dr. Janaki Ammal has already published a count of 'Lionel' as being an aneuploid (2n=24).

The breeding of white Nerines has always been high on the agenda at Exbury and last Autumn Mr. Fred Wynniatt, the head gardener, had every cause to be proud of his latest successes. 'Vestal' had an enormous umbel and glittering flowers, white enough to make even the most ardent detergent manufacturer envious. 'Sacred Heart' from the same cross—'King of Belgiums' x 'Pure White'—was unfortunately not in flower. 'Wisley Bridesmaid' with rose pink flowers is quite outstanding and at last I have been able to add a bulb this year to my own collection.

Among the new seedlings flowering last year as yet un-named, a cross between ('Dolores' x 'Spitfire') has given some very attractive plants. This is the second season I have seen the seedlings from this cross in flower and this time there was a very fine salmon pink clone amongst them.

'Wellington Koo', the chance blue seedling responsible for so many of the unusual shades in the Exbury collection, is still turning out some very interesting seedlings. Two good mauves were from 'Carita' x 'Wellington Koo' and 'Wellington Koo' x 'Best Blue'. A good salmon pink with a darker line came from 'Pamela' x 'Caryatid' and a rather lovely white flushed pink from 'Chloe' x 'Snow Flake'. My own tiny offsets from these wonderful clones are slowly getting bigger and giving more flowers each year. On the breeding side I have concentrated more on attempting to cross Nerines with higher chromosome numbers and consequently have had a correspondingly high number of failures!

'Inchmery Kate' has obliged me with a small crop of seedlings using pollen from 'Ispahan', but I find these are very slow growing indeed.

This year we have had virtually no Summer in England to ripen the bulbs and even as I write in early August 'Mariloo' has decided that Autumn has arrived and is poking up flower buds.

Graystead, Bovingdon,
Hertfordshire, England

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

AMARYLLIS REMINISCENCES

LEON BOSHOFF-MOSTERT

The cultivation of *Amaryllis* in South Africa during the past decade has assumed large proportions and it can be said to have developed into a major horticultural industry.

It is difficult to assess how much has been done in the direction of intensive endeavour towards the creation of more attractive types, colour breaks and departures from previous standards by the presentation of something "new and different".

To my knowledge, there are only a few of us, since the Buller era who harness our energies inclusively to this end. In each case we are not mass producers but, in the stricter sense of the word, devoted specialists to whom the wholesale distribution of commercial bulbs has never become an economic essential. During my visit to America I found this phenomenon to apply in an appreciable degree to the Iris world, in which the U. S. A. undoubtedly leads the field. In this sense I refer to the many outstanding specimens produced by fanciers in small private gardens.

A few years ago, through the medium of the Year Book, I urged members of your Amaryllis Societies to concentrate on this aspect since, from my personal observations in various States, success on show benches at that time could not be attributed to endeavour, but rather to acquisition. At the present time, however, it is clearly obvious that the States are well on the way in the right direction.

There is no doubt in my mind that the time is not far off when American bred *Amaryllis* will hold their own in any company. From what I have gathered, this tendency has developed rapidly, particularly in California. The same spirit is also actively permeating through South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas. American *Amaryllis* lovers owe a considerable debt of gratitude for the activities of and lead given by their countrymen whose names appear in the list of Herbert Medalists. All these names indicate great men of achievement and it would be presumptuous on my part to single out any one of them. I do feel, however, that my readers will agree with me when I say that, particularly in the "Advance the Amaryllis" campaign, Robert Goedert of Florida has earned our sincere good wishes for his continued success.

Reverting now to the Buller era, when this veteran was the King of Amaryllis in our fair land, only a negligible fraction of South African gardeners were then even aware of the existence of the *Amaryllis* which, at first sight, many would generally refer to as beautiful lilies. Therefore, when the wonderful opportunity came my way, I lost little time

in popularizing this flower among domestic gardeners. I do not claim to have been the first here to offer *Amaryllis* to the public when I commercially introduced a comprehensive range of the cream of the Buller collection. There were already nurserymen who allotted a portion of their activities to *Amaryllis*—rather by way of a horticultural Cinderella share.

But as the pen is claimed to be mightier than the sword, I accepted this axiom by contributing articles with 'photos to horticultural journals and other publications. This brought invitations from the South African Broadcasting Corporation to deliver radio talks on the subject, which I gladly accepted as a means of furthering my Amaryllis advancement campaign.

I was determined to honour the undertakings given to Mr. Buller to carry out his work and, at the same time, to prove myself to be worthy of his confidence when he wrote in September, 1950, rather in prophetic vein that he could "see the day coming when Kleinskuur Amaryllis will be supreme in the land. If you carry on . . . I shall be happy to hear of your good work. I am near 80 years old and cannot go on much longer." Additional stimulation was not lacking, such as that "It will be great fun for you to see your first big batch of seedlings opening their first flowers."

With such continuous encouragement and assistance with a fount of detailed advice on culture, breeding and propagation, Mr. Buller not only inspired me to boldness to write those articles but also instilled in me an unabating enthusiasm for breeding. In all my work I was constantly mindful of the fact that in the plant world, as in all other fields of achievement where advancement is a continuous challenge, nothing remains static. The day could be foreseen when, what was then the coveted collection, could not remain so without progressive improvement.

To a large extent, in all modesty I feel that, although not beyond recognition, I have nevertheless improved on the Buller collection in many directions except the pure whites. Especially in the direction of bi-colours, polychromes and picotees, the collection has been much enriched. In blends and monochromes, both in pinks and reds, there is also a marked improvement, particularly in reds with which I have had gratifying results in the intensification and depth of colour. Here I think in particular of a deep cherry red with an overlay and veining of rose red. This one I have named 'Buller's Memory'.

Then there is 'Porcelain Belle' which is an outstanding blend of porcelain rose and venetian pink in large blooms majestically carried on proportionate scapes. In the same category can be placed 'Ida Eleonore', named for our second daughter. This is a blend of porcelain rose and begonia with a flush or overlay of geranium lake.

In the picotees I have had my full share of success. 'Lady Jane', of all things named for my devoted Cavalier King Charles Spaniel, is a white with a slight veining of claret rose towards the edges and a complete claret rose line around the entire bloom. 'Harlequin' is a

blood red with white flushing towards the tips of the segs and distinctive veins and a picotee edge in currant red.

One of my best I have named for my esteemed friend and the well-known champion of the Amaryllis in Louisiana, namely, Lonella Haydel. 'Mrs. Haydel' is a bi-colour picotee in geranium lake with white flushing and white central star. It is attractively framed in a pencil line of deep geranium lake. I could not think of any better way of paying tribute to this great lady for her charm, her unflagging enthusiasm and devotion to and infectious love of the Amaryllis.

In Mrs. Haydel's company I place 'Edith Myrle'—to my readers Mrs. Nahas of Sacramento, California, who, on behalf of the Mayor, presented my wife and myself with the Key of that Capital City. This is a white with vermilion tiger-markings and a blood red picotee all round. In spite of the delicacy of colouring and shading, it is a striking bloom which commands attention.

Another American lady to whom I wish to pay tribute is Mrs. Marie Fischer of Hinsdale, Illinois. 'Marie Fischer' is a currant red with a generous white flushing and overlay on the outer halves of the segs which are pin-pointed in currant red and completely framed in a deep currant red picotee.

'Hubert Fischer', although not a picotee, bears a strong resemblance to his wife. It is a cherry red with strong currant red influence and splashings of white towards the tips. 'Jan Hendrik', named for our youngest grand-son, is another striking bi-colour in crimson with a white central star and tiger-markings at the edges of the star. His sister Greta who is the eldest of our nine grand-children should have been grouped with the picotees, but for family ties is grouped in this paragraph. 'Greta' is an enlarged and improved 'Corpus Christi'. It is a white with claret rose pin-points and a pronounced picotee of the same colour in a darker shade.

Another exquisite bi-colour is 'Dazzler' which presents itself in orient red with a white flushing in the throat and along the inner halves of the midribs.

'Linette'—also named for a grand-daughter, ranks high among my polychromes. It is a fine and delicate bloom in dawn pink and empire rose beautifully set off against the white of its midribs.

These are all persistent four-bloomers which are proving that I am working along correct lines in my breeding schedule, a matter which Dr. Traub so kindly but emphatically stressed upon me during my visit to La Jolla about six years ago. The same was also confirmed by a substantial number of high-grade later varieties which bloomed for the first time this past season.

As a novelty, I am concentrating on green Amaryllis and have made encouraging progress in that direction. I am concentrating even harder—but not as a novelty—on breeding something equal to the best Buller whites such as 'Dallas Bride' and 'Avalanche'. I have not yet brought to light what I am looking for, but I shall persevere also in that direction.

In describing some of my successes, I do not wish to give the impression that I am laying claim to having out-moded the Buller creations. There are still some of his varieties, I am sincerely convinced, that will remain classics despite all claims and challenges.

During the past three years my health has left a lot to be desired. I was hospitalized for several spells and am still continuously under specialists' treatment. It is no exaggeration to say that over that period my effective labour output could not have been more than 50%, in consequence of which something perforce had to be neglected. As I have said in previous articles, my Amaryllis undertaking is a specialized one-man show where only routine unskilled activities can be entrusted to others, whilst administrative and executive responsibilities cannot be delegated. I am most fortunate, however, in having an outstandingly capable wife who relieves me of much of the supervisory as well as office work. This enabled me without interruption to keep up my breeding programme which at least suffered no set-back, whereas the commercial aspect had to be sacrificed. Luckily, my amaryllis concern is more a labour of love than a source of livelihood, otherwise we would by now have been on the dole!

I reluctantly refer to this somewhat personal aspect which is rather inappropriate in an epistle of this nature. It is done only for the purpose of conveying to the many correspondents the reason for my inability to respond to their enquiries for bulbs and price lists. Should the condition of my health continue to improve as it has done over recent months, I have every confidence that in the not too distant future I shall again be able to devote time to overseas enquiries and interests.

During each blooming season we have hundreds of visitors to Kleinskuur who are interested in Amaryllis as well as in my wife's Iris, Hemerocallis, Hostas, various varieties of Calla Lilies and other perennials. Among these visitors there is a fair number who, since they first acquired Amaryllis from me some ten or eleven years ago, have developed into discriminating fanciers. Year after year they regularly come to see what is new and to make selections from my latest would-be introductions. Some of these fanciers have by now also taken up hybridizing in which I have encouraged them. It is most difficult to refuse them even single off-sets of these selected hybrids before the mother bulbs go to incubation, with the result that it takes years before the would-be introductions can reach the catalogue stage. It has already happened that almost the entire incubator crop of such new hybrids were taken up at the year-old stage. This applies in particular to the new varieties previously described and their "stable-mates" which further adds to my difficulties in offering stocks for export.

In early September, 1965 I placed over 2,000 segments from many of my best varieties in the incubators in an endeavour to build up stocks to fulfill the needs of all my fancier clients and at the same time again to be of service to my overseas friends.

During recent years I have interested myself also in the *Crinum bulbispermum*. It was only after exploratory excursions that I found

our region to be comparatively richly endowed as far as variety is concerned. I have found a range varying from pale pink, almost verging on white, to some very deep reds. Since these excursions into uncultivated fields do not entail exhaustive walks, my method is to stake steel plate markers next to those I select when in bloom, to make a rough sketch of the area and then to lift the bulbs in the dormant season. I have also gathered seeds from crosses made in the veld and am looking forward with great expectation to the blooms of my own seedlings.

The scope offered in the field of breeding will always remain unlimited and each decade—in fact each added year, contributes its share to a change in face and pattern. In conclusion, therefore, I wish to assume the role of moralist by expressing the view that it is not only the privilege but also the pleasant duty of each true lover of the Amaryllis to make her or his own personal contribution towards this never ending wonder. Be assured, the reward will be lasting joy and happiness!

1964 & 1965 AMARYLLIS SEASONS IN FLORIDA

Mrs. Fred Tebben, *Lake Hamilton, Florida*

The 1964 season of bloom opened with a lovely flower on my hybrid clivia, purchased many years ago from Houdyshel. It was a pretty thing, white with the upper one-fourth of each petal a deep orange, eight flowers on the scape. Buds began showing up in the borders in late February but no flowers appeared until March. On March 12th my husband and I took off for a Caribbean cruise which took us to Puerto Rico and to the Virgin Islands. I had hoped to see many amaryllis in bloom in the islands, but was much disappointed as I saw none anywhere there, but on our return to Miami I saw many beautiful blooms everywhere. One very impressive sight thrilled me there. Blooming all around a house were literally thousands of the orange-red variety with the greenish-yellow center spot which they tell me here is the original *Amaryllis belladonna* L. which grows so easily with no care or attention, and multiplies fast. I have a number of these but so far none have bloomed for me. There were many fine borders of *Amaryllis* x *johnsonii* too, and many throughout Miami that must have been Meade strain bulbs. All were so nice.

Returning home via the west coast of Florida, we stopped at Sarasota and had a nice visit with Dick Guerdan and saw his new place of business, and saw many fine orchids in bloom. Upon reaching home on March 22nd we found many amaryllis blooming here, among them 'Apple Blossom', 'Miss Margaret Truman' and 'Love's Desire'. There were several fine seedlings in bloom too, one much like 'Five Star General' and just as good, I'm sure. Next came 'Ludwig's Dazzler' and 'Doris Lillian' and then Picotee, which is very nice indeed. However, it seemed that some spots were empty where 'Bouquet' and 'Delilah' had been planted. They are two that do not like being planted

in the borders, it seems. There were many fine Meade blooms and many seedlings that were nice but not outstanding. I feel very frustrated because I cannot identify any of my seedlings since they became badly mixed and labels lost when planted in the gardens of friends here in Florida when we were moving down from Illinois. Quite a number of Dutch bulbs did not bloom but I would certainly recommend 'Apple Blossom' for outdoor planting. It is really a fine performer, producing several scapes from each bulb and many new offset bulbs.

In July, 1964, my husband suffered a serious heart attack and was hospitalized for five weeks. He seemed to come along well, however, and we had a happy Christmas season with a visit from our son and from nieces and nephews from various places around the country.

Our winter of 1964-65 was a very mild one, and so the first amaryllis buds showed up in old *Amaryllis striata* var. *fulgida* by mid-February in the borders, as well as buds in the crinums. I purchased a number of the smaller sized bulbs and these bloomed well, but I was disappointed to find 'Rose Marie' and 'Aphrodite' were exactly alike, and must have been seedlings. There were many blooms everywhere among the borders. 'Happy Memory' was lovely, and so were dozens of other Dutch bulbs for this has been my best season of bloom so far. In 1962 Polly Anderson sent me some tiny seedlings from crosses made by Quinn Buck, and all of these bloomed. They were really outstanding, light reds and pinks, with lovely round blooms, and I felt thrilled to get blooms from seedlings in three years. Then, too, an old, old bulb bloomed again, 'American Beauty', purchased at least twenty years ago from the Cammack Growers at Maitland, Fla. This is a lovely cross between Dutch and Meade strains, and I am so glad to find I have this one still for the Cammacks sold their flower farm and went out of business many years ago.

My amaryllis notes end on April 4th, as my husband suffered a number of severe heart attacks and passed away on April 14th. I will remain here in Florida as long as I can find help to maintain this large yard and the borders. It is home here now and I love it even tho I shall be very lonely without Fred to be here with me. He loved it too, and enjoyed the four years of retirement he spent here.

THE 1964—1965 AMARYLLIS SEASON

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ADAPTATION IN AMARYLLIS

After several seasons of rather severe winters especially in the amaryllis belt of the south, this past winter was much milder. Amaryllis had a rather long growing season with enough moisture in the soil in the fall to encourage the bulbs to set a good crop of roots which helped to carry them through the winter in fine condition. Reports from all

over the south this past spring were good. It appears to have been the best flowering season in many years. Old bulbs have recovered from their set back suffered during the past several cold winters. Exceptional flowers were reported and many are taking renewed interest after having been discouraged over the past several winters. This off and on interest is the story of amaryllis and I believe it comes from the belief that amaryllis are easy to grow while these same people might think orchids are hard to grow. Possibly the truth is that both are easy to grow if given the exact requirements they need; however orchids possibly have more of a universal requirement than amaryllis. Also orchids having more commercial value have received more attention. Much research on their culture has been accomplished. The orchid fancier goes to great lengths to provide exact conditions for his plants whereas the new amaryllis fancier does not. The new orchid hobbyist will perhaps acquire one or two plants, experience difficulty, and then at great expense and use of his time he will build a greenhouse exactly right for orchid culture. If by this time he has not lost his interest he is prepared to have success with his orchids. On the other hand someone seeing a beautiful amaryllis becomes extremely interested in this plant. He inquires about it and the owner of the amaryllis says "Oh, there's nothing to it. I just bought a couple of bulbs, went out in the back yard, got a little dirt, set the pot on my window sill and Presto!—the tri-color in the show." The new fancier never asks the one who won the tri-color several years ago why he hasn't won it since or why he doesn't have any flowers in the show this year. He could advise the new enthusiast that it was just luck that he happened to give the bulb the exact condition it wanted that particular year and that at least half of its performance was determined by the attention it got during the growing season before; that the Lord had been kind to the Holland growers that particular season with an abundance of sunshine and good weather.

Had this new fancier asked one who had been through the bitter experience of failure, I am afraid he would have possibly received the same answer in just a little different way. It would have been something like this—Oh, yes, amaryllis are easy for me to grow. I won this Tri-color several years ago. Don't try anymore, you know, one should not be hoggish. He probably hasn't had a nice flower since he won the Tri-color. I don't know why amaryllis fanciers have this psychological block when the orchid grower does not. But until we amaryllis growers want to admit that amaryllis are as hard to grow as orchids if not harder we will prevent this flower from becoming as popular as it should be.

A number of people will disagree with me on this view. They will point out many cases that will give weight to the fact that I don't know what I am talking about. Amaryllis are really easy to grow. They will point out several beds in their neighborhood that perpetuate themselves and bloom abundantly each spring. They also will tell you that they too had such a bed at one time. So did I but they are gone now. Once they become really interested in the flower their luck runs out. The fact is he knows nothing about the requirements of amaryllis and when

he becomes interested he notices that some of his did not flower each year. This he was going to correct. The more he did for them the poorer they flowered and finally he lost the bed.

I know where several of these beds of amaryllis in my neighbor are that flower each year with little or no care. I am afraid to approach the people who own the amaryllis as I know they believe it takes no special knowledge to grow them. If I said something to them they might dig the bed and replant them in another place in the yard and in a few years more or less they probably would lose every one of them.

I would like to tell you about three beds of amaryllis in my neighborhood and one bed of *A. belladonna albertii*. I asked the person who had this bed of beautiful *albertii* for just one or two bulbs. He immediately dug the clump of about 50 bulbs. He gave me half of them and he replanted the other half not 10 feet from the old bed. We lost all those bulbs within one year. Now, why did this happen? The fact is we both thought amaryllis were easy to grow and that all you had to do was stick them in the ground. We did not analyze the existing environment under which they were growing and although part of the bulbs were moved only ten feet they had an entirely new environment. It is my belief that we would also have lost them if we had replanted them at that time in the exact same spot.

Amaryllis belladonna will naturalize in peninsular Florida. However they often will perish if moved. I don't know all the answers to this problem but believe I have found some factors that are common to either success or failure by observing many naturalized clumps. These factors, I believe, can be applied to the hybrid amaryllis. These are applicable to the Florida area and should not be misinterpreted for use in other areas particularily those with little rainfall.

A. belladonna is considered to be evergreen; however, like most amaryllis in the tropics they more or less have a dormant season due usually to alternate dry and wet seasons rather than extreme changes in temperature. Whether the earth is in a cooling or warming cycle does however have some effect. I would like to point out that in the tropics although there is less change in temperature there are also two seasonal cycles a year where further south or north there is only one. In the tropics amaryllis therefore often flower in July and again in December during changes in these cycles.

Amaryllis in the wilds grow in various places . Many grow on rocks, stumps, or even in trees. Most of them grow where it is well drained especially during any dormant period or cold period. *Amaryllis belladonna* however will grow in muddy low areas in the tropics where the temperature is always above 70°F. but where night temperatures fall much below 70°F. it requires a dry area during low temperature levels and will rot easily if given a cool damp condition.

In the state of Florida where *A. belladonna* is found naturalized, generally a sandy soil exists. The summers are warm and damp; in winter there is less moisture and the springs usually very dry. Under these conditions *A. belladonna* will naturalize. The temperatures should not fall much below 50°F. for any long period of time and the soil

should be relatively dry during cool periods. I would like to point out that *A. belladonna* possibly has the widest growing range in the wilds. Even it however is not found growing in abundance but only in small habitats or individual clumps. They grow in very limited areas in nature often not more than a few feet in area. This is because its requirements are more exacting than those of many other plants. In Florida one usually finds *A. belladonna* naturalized only in ground where moisture is exceptionally low during the winter season and moisture is most plentiful during the summer growing season. One may take exception to this as they will be found growing in flat low land that does not appear to be particularly well drained but this fact still remains a prime requirement and there are reasons for apparent exceptions. Usually after a clump of amaryllis is well established their root system can help take up excess amount of water and will grow in damper areas when newly set out plants will not. One might a-k if this is true how did the clump ever get established. The answer is that the bulbs when originally planted were planted before or during an active growing cycle and got established before cool weather set in. Possibly if one would check further the winter following the original planting would prove to have been mild and dry which had helped considerably in the bulbs getting established. Other factors play a part. I have found that soil where *A. belladonna* is naturalized is often matted with tree roots. These roots absorb excess moisture. Amaryllis seem to like this condition and often do well at the base of trees where they compete with tree roots for moisture. The tree roots taking up moisture keep the soil dry during the winter which helps insulate the bulb from cold damage. *A. belladonna* is often found growing under the eves of houses where soil moisture is reduced. In most areas where I have found *A. belladonna* naturalized excess moisture in the soil is removed very rapidly after rains. Of course during the summer rains and the period of rapid growth there is an abundance of moisture for both the amaryllis and any root competition from the trees. Another factor that is important in the culture of amaryllis is that they do not like quick or sudden changes in soil temperatures. Most will do best where soil temperatures stay relatively the same. *A. belladonna* is particular in this respect and this is possibly the reason one finds it difficult to maintain this species in pots. The pot being small the soil changes much more in temperature during a day's time while the temperature of the open ground changes little. *A. belladonna* is often found growing in a protected area on the east side of houses which receives the early morning sun that keeps the temperature up during the winter.

Now back to the case of my friend who lost his *A. belladonna albertii*—his clump grew under the eve of his garage with an east exposure and the ground drained abruptly away from the building. He probably planted the original bulb in the spring after the weather had warmed up. It made good growth the first season and winters were possibly mild for several years until the clump was established. After the clump was established it could absorb excess moisture. Being under the eve of a building it received little moisture except with an east wind.

When the clump was dug it was replanted in the fall which was wrong. They were replanted in a poorly drained area and not against an east wall that could absorb a maximum of heat during winter days. So my friend lost his beautiful bed of *A. belladonna albertii*.

I believe we all can learn something from this experience. First, if you have a clump of amaryllis that is doing well, do not bother it or replant them until you have throughly determined why they do well there and can duplicate the environment. Even then you may fail. Amaryllis often will linger for years in a location under adverse conditions, then come forth with flower during some abnormal weather or other change in environment often lapsing back to a mere existence afterwards. Amaryllis do have exacting cultural requirements.

I would like to mention the three other clumps of amaryllis near my home that I spoke about. First is a bed of *A. x johnsonii* that grows on each side of a walk that leads to the front door of a small home. Along the walk on both sides are azaleas and there among the azaleas they grow and produce hundreds of spikes each year. Why they grow in this acid soil so well I do not know but *A.* x *johnsonii* appears to be tolerant to the acid soils in the south. A second clump grows not far away in a narrow space between azaleas and a drive way. These appear to be Nehrling hybrids and make a riot of beautiful airy orange red flowers each spring. They are possibly a hybrid between *A. belladonna* and *A. striata*. Another bed of Mead hybrids in a yard near a deep ditch makes an exceptional showing in my neighborhood. Generally the Mead's hybrids in Florida will grow in a wider range of soil conditions but as a rule where amaryllis are found naturalized in Florida they are *A. belladonna*, *A. striata* or a hybrid of these. These are much harder to transplant but in those rare cases where they find a suitable condition they grow and thrive with little attention if the environment is not changed. They do have exacting requirements.

Getting back to the past season the named Dutch varieties still demand the greatest interest among the hobbyists; however, there is more interest being shown for pot plants for home use and amaryllis as border plants. I feel the interesting show type flowers have been stressed too much by the American hobbyist to the detriment of the development of more vigorous types. The medium and miniature sizes for pot and border culture should be stressed more. A bulb can not support one or two huge spikes of flowers each year but could support a reasonable sized spike. Most complaints by customers are that their bulbs just do not flower each year or that they soon degenerate and rot away. But in spite of this they continue to buy the largest flowering sort in the catalog seldom realizing that many of these clones degenerate after they have flowered one or two seasons. *The public should seek and demand more vigorous clones.*

BULB SIZES

With the increased interest in amaryllis purely for personal pleasure more amaryllis in smaller bulb sizes are being sold. The 22/24 cm size being about the smallest size that will flower as a rule. These can

normally be purchased for about half the price of the 28/30 cm size. While the flowers they produce are normally small the first year these younger bulbs seem to establish themselves better with less care and less chance of decline has been observed. Of course for the show circuit the larger the bulb the more chance one has for obtaining that 1 in 1000 tri-color for the largest and best in the show.

HYBRIDIZING

I think generally more people are interested in planting seed both for pot and border use. While most want seed from Dutch clones many realize that these crossed with select hybrids of other origins will produce superior plants as far as vigor is concerned. More of these special hybrids should be developed. The Dutch hybrids have a limited color range whereas by crossing them with other selected hybrids one can get an endless range of color tones. Crossing the Dutch on species and the Dutch on selected clones of other strains if properly picked can produce many new color shades. I would like here to tell about a few such crosses and what they produced. Others can be made that will be just as different and outstanding.

The first hybrid I would like to talk about is a cross made by Mr. Howard Cooper of Hawaii. He crossed the hybrid clone 'Floriade' on *A. aulica platypetala*. This cross produced some interesting seedlings. All favor each other generally being rather large with a white background with pin stripes or bands. They are exceptionally beautiful, different and of an airy form. This cross produced mostly shades of pink, salmon, orange and red. All look like kissing cousins and grow vigorously. These seedlings are all very late flowering like its seed parent, *A. aulica platypetala*, and come into flower a full month after the regular hybrid. Other color shades can be obtained by crosses of other colors of Dutch hybrids on *A. aulica platypetala*. By crossing it or any other selected clone or species with inbred Dutch hybrid clones you can very nearly set the color for the inbreed Dutch clone. The Dutch clones usually have little other color in them and the offspring normally will be a similar color blend of the Dutch clone used in the cross. Of course in crossing the Dutch clones on a species the form will generally be a blend of the two.

When one uses a select hybrid clone to cross with the inbred Dutch clones usually one can predict the color shading much more accurately than type or form of offsprings but neither can be predicted nearly as closely as when a species is used in a cross with an inbreed Dutch clone. To illustrate this I would like to comment on a cross I made several years ago the seedlings of which I flowered this spring.

I used a Tunia's Australian clone I obtained from India as the seed parent and a Dutch clone as pollen parent. I do not remember the specific pollen parent I used. There may have been several which is not really too important. The seed parent was a large rose colored flower with green on the mid-rib. The color reminded me of *A.* x *johnsonii* but of course the flower was much bigger at least 8" and with wide segs. The seedlings produced from this cross with inbred Dutch clones had an

exceptionally wide color range from pink, salmon, orange, rose to red. They have the greatest number of shades of color of any other hybrids I have seen. The form of the flowers were reasonably good. Many, about 10 to 20, rivaled the best Dutch hybrids. There were some of the most exceptionally fine brick rose and brick red shades I have seen. A good percentage of the flowers were solid colors of the Dutch or Leopoldii form. The others show some green or white on the mid-rib of reasonably good form. Many of the pinks are the lightest I have seen and the pink particularly show the wide flat form of *A. psittacina*. However few except pink show this form.

Those who observed these hybrids said they had not seen anything to rival them and they seem to be exceptionally vigorous and would make wonderful border plants as well as show flowers. I mention these two crosses as it points out what can be obtained by using a select hybrid clone or species and crossing with the inbreed Dutch clones.

SELFING

Another interesting group of seedlings, I flowered this year, are self pollinated seedlings of this clone with three distinct characteristics; flower that has a faint picotee edge and some dotting. It is the most free flowering clone I have and therefore deserves my attention. The self pollinated seedlings of this clone have three distinct characteristics. First the selfing produced some near whites with only a very slight trace of purplish red penciling. Some are rose and white and resemble the species *A. leopoldii*, at least the pictures I have seen of this species. The others range from nearly solid red with white tips on the petals. On those showing white generally the lower three segs were near white. A few were near duplications of the Dutch clone, 'Beacon'. By inbreeding these seedlings one or two more generations one could set, I believe, pure type and color and when crossed with inbred Dutch could predict the offsprings that would be reasonably similar in both color, form and growth. More work in this field is needed to develop good commercial garden and pot plant sorts at reasonable prices. A very interesting aspect of this is that further inbreeding of this particular clone could produce a duplicate of species *A. leopoldii*. My guess of the parentage of 'American Beauty' is ¼ *A. elegans*, ¼ *A. pardina and* ½ *A. leopoldii*. I believe new hybrids can be developed that are much superior to those on the market today and in this respect I would like to suggest several crosses that I feel would be especially good for Florida and the southern states.

SUGGESTED CROSSES

Dutch clone x *A. aulica stenopetala: A. aulica stenopetala* is a fall bloomer and grows easily in the south, is reasonably resistant to insects and should make vigorous hybrids. It is a large flower type so you should expect large flowers.

Dutch clone x *A. striata* var. *striata* SA63-22: this species however is small or medium sized but is more vigorous growing and easiest to

maintain in my area. *A. striata* matures fast and generally makes lots of offsets. This particular species has much more vigor and does not fall victim to Mosaic disease nearly as rapidly as other varieties of *A. striata*. It seems to tolerate more water also.

Dutch clone x *A. Reginae:* while *A. Reginae* is not a particularly good grower for me I can say I have fair success with it but to develop baby pink shades of amaryllis I feel this is the only one available that does not have orange or yellow in the red pigment in the segs and if crossed with white Dutch should produce pink seedlings. Let's see if my guess is right.

There are other crosses on selected hybrids one might want to make also with the species but the above species seem to be in my opinion best for using to develop hybrids for the south eastern states.

I will make one noteworthy exception. From about 2 months experience with A. cybister spectabilis I would like to predict that this species will be well adapted to this region and I feel can be naturalized in Florida and along the Gulf and Atlantic. It may prove to be a real find for hybridizing both for new forms and more vigor in our hybrids.

I would like to comment here that one might find other more acceptable species for breeding purposes in the more arid climates of California and the western states. Northerners may find some of the other species that like a much cooler growing temperature better for their particular area. I feel in this respect everyone interested in hybridizing amaryllis should try some of the species. You will find most of them difficult to grow but then one never knows when he will discover one very well adapted to his particular culture and region. The limits of color shades and forms in amaryllis have hardly been touched and one can develop his own personal likings in new hybrids that can not be purchased.

NEW CLONES

In touching on the past season one can not neglect to comment on the new Dutch hybrid clones as well as those that have performed well for us for many years. One also must touch on the new clones from Africa. As the African clones are available first in the season I will make my remarks on them first.

HADECO CLONES

Of the Hadeco African named clones 'Rosaline' still is the best performer. It is a fine amaryllis in white pin striped brick rose, the general appearance of light brick rose. Next popular of the older clones is 'Tangerine', a free flowering orange that can make 3 spikes from a 24 cm bulb. How this can be possible is hard to imagine but it often does this. The flower of this clone is reasonably large. It is a wonderful pot plant. Clone #65 is scarlet and is exceptionally free flowering. 'Rosedale' is a good turkey red or rose red. Clone #307 is a beautiful cardinal red that literally shines. 'Vintage' is the best dark red. Four outstanding new clones will appear next season. Best by far and one of the

most beautiful orange colored amaryllis I have seen is 'El Torro', a most beautiful coppery orange that just reminds me of Spain and the colorful pageantry of the bull fight. 'El Picador' slightly darker, is also outstanding in the orange tones and one most collectors will not want to miss. Clone #242 is a large new pink and white striped and flushed clone that gives promise of becoming a good one in this color. 'Rubra' is another fine promising clone in camellia rose. The African amaryllis are popular for early flowers and the newer clones appear to be much improved. One can now get named clones in shades of red, rose, orange and white & red. A full line of colors will be available in the future.

VAN MEEUWEN CLONES

The Van Meeuwen prepared amaryllis for early flowers which are available a month ahead of the regular stock are popular with many. This firm has been making rapid improvements in the quality of their clones both from the standpoint of perfection of flower as well as performance of bulbs. In recent years they have introduced many outstanding clones.

New this season is 'Bernice'. This is a very large tall growing dark red that is *fragrant*. It appears to be an improvement over their older 'Tristan'. It will become a leading dark red if not the leader in this field if its performance continues as good as it was in trials this past season. Look for this one to be the top dark red in coming seasons, a spectacular new one. New also this season is 'Queen of the Night', a very nice new dark red of regular form not as large as 'Bernice' but a fine one. 'Artemis', a new white flushed and striped rose red, is exceptionally tall and large flowering, a giant type.

I will try to name other outstanding clones from Van Meeuwen by performance. However I would like to say here that most of these listed here are also leaders in their color class in my opinion.

The most outstanding clone from Van Meeuwen is 'White Christmas'. It is most free flowering and extremely popular which it deserves. This is possibly the best white available for pot culture. 'Rembrandt' is one of the finest orange reds I have ever seen, large and easy to flower, very outstanding. 'Mars', a medium dark red is outstanding. This one appears to do exceptionally well in California. It is a very vigorous growing plant that reaches a height of 6 feet. 'Pygmalion' and 'Rose Marie' are exceptional free flowering whites, flushed pink, a color that is becoming very popular and these two are fine sister clones. 'Cupido' is a fine free flowering white and orange blend that grows large easily. The Van Meeuwen clones are among the most free-flowering for pot culture and those mentioned you will find to be exceptionally good.

W. S. WARMENHOVEN CLONES

W. S. Warmenhoven has introduced several new clones in the past few years in the blends that are becoming most popular. Among these are 'Catherine Valenti', rose pink to dark rose and white; 'Mount Everest', pastel brick rose and white and 'Television', French rose and white. All three of these are similar except in a different shade of rose. All

are worthy additions to any collection. Warmenhoven's 'Floriade' and 'Golden Triumphator' still remain popular in the blends and their popularity does not seem dented even by lower prices for similar clones.

'Bordeaux' and 'Moreno' are particularly good in dark rose and the only ones in this particular color. 'Violetta' in violet rose is still popular. 'Oasis' is still one of the top whites and a fine one. 'Beacon', 'Elvira', 'Armango', 'Little Diamond', 'Marion', 'Orange Wonder', Pink Beauty', 'Red Master' and 'Sweet Seventeen' all remain popular and are all outstanding clones.

C. WARMENHOVEN CLONES

C. Warmenhoven, a small firm, furnishes some of the best red colored clones. Possibly the most beautiful red I have seen is 'Flamboyant'. This is of flat form and a most beautiful medium red color and texture. It is not easy to grow but to those who will take the extra care it can be outstanding. 'Red Champion' is a huge large medium red that is an excellent show flower. 'Top Score' is a fine medium red and 'Apollo' is a very good easy flowering orange red, C. Warmenhoven's new orange, 'Mrs. Warmenhoven', is an excellent new orange. This coming season they will introduce a new dark red, 'President Kennedy'. As this firm is known for its beautiful dark red clones this first one to be named should prove to be outstanding.

LUDWIG & CO. CLONES

Ludwig & Co. in recent years has introduced some fine new clones in pink shades. These are much lighter than their previous introductions such as 'Pink Perfection' and 'Pink Favorite'. 'Dutch Belle', 'Heaven Sent' and 'Flora Queen' are all outstanding and a little different in shading. 'Flora Queen' has a lavender tone to it. Clone #101, not yet named, is as light but its color is not as clear. It, however, makes up for some of this by its vigorous growth. It is also a fine clone. 'Sight Show', just a little darker pink, is excellent and 'La Forest Morton' leads the pack in the rose pinks.

In whites Ludwig's 'Winter Carnival' is hard to beat. 'White Giant', 'Marie Goretti' are still among the best whites.

Ludwig's 'Home Decorator' in coppery salmon, 'Beautiful Lady' in rich medium salmon are good additions in this color. 'Bouquet' still is a leading clone in a lighter shade and 'Delilah' in tangerine orange is in a color class all of its own.

In salmon pink 'Spring Dream' and 'Prima Donna' are both outstanding.

In pink flushed whites 'Apple Blossom' and 'Love's Desire' are still popular but are finding competition from similar clones of other growers.

In the bi-tones 'Carousel' is outstanding. It makes late flowers of good quality to end the season. Not as striking as 'Five Star General' was at one time but it still is the best available.

The Picotee Clones—white with fine red edge—are extremely popular and beautiful. They are the most popular type today. Some diffi-

culty with cultivation has been experienced with these but they are most worthy pot subjects.

In reds, Ludwig's new 'Red Coralin', a medium dark color appeared last year. It seems to be a good new red. 'Ludwig's It' in darker red is exceptionally good. 'Ludwig's Goliath' is a huge free flowering sort. It gave 9″ flowers on 24 cm bulbs last season.

'Streaking Stripes' is a fine white and green striped red variety that is *fragrant* and beautiful. It is a really fine amaryllis.

I nearly forgot to mention 'Trixie'. This is a most outstanding medium rose with fine flat form.

CLONES OF OTHER BREEDERS

There are other clones that should be mentioned from other growers. 'Cavaliere' is a huge orange red of excellent quality. 'Day Dream' is a sensation in a blend of shrimp pink and white much like 'Margaret Rose' or 'Sweet Seventeen'. 'Flying Cloud' is an exceptionally free flowering white. 'Mohawk' of which about 25 bulbs were shipped to the United States several years ago was a sensation. Propagation difficulties kept this one from being available for several years. This coming season it will be available again. It is a giant dark red much like 'Red Master' except that it makes 4 flowers per spike and appears to be more vigorous. Bulbs of it will surely be in demand. 'Fair Lady', a blend of vermilion red, is different, beautiful and a fine one. 'Orange Orchid', a very beautiful new orange, is so bearded that it appears double at times. It is possibly the leading orange. 'Scarlet Leader' is a very free-flowering medium red and exceptionally fine clone that one can force easily.

SPECIES

Before I leave you for another year I would like to touch on some of the species I have imported along with others I have had experience with. Possibly I may be able to help you identify some of the species that I have from time to time imported from South America and which you may have.

Species SA1-5, 1-60, 3-60, 4-60 and 6-60 and SA62-4 although all have not flowered, appear to be *A. aulica stenopetala*. This species grows vigorously in the south. The flowers vary in size from about 5″ to 8″ diameter and segs from $1\frac{1}{4}$ to about 1″ wide. Segs are apple green about half way up their length with the outer portion light scarlet. The scarlet coloring varies in brightness quite a bit. This species sets seed poorly for me but I have self seeded it and crossed it with hybrids. It flowers in October-November and has an early summer dormant period. It has stood temperatures down to 25°F. when in full growth during the winter. Large bulbs are about 3″ in diameter. It grows well in community pots several to a six or eight inch pot preferably in peat but have also flowered them in pure coarse sand.

Species 12-62, which I sold for *A. blumenavia*, has flowered once. It grows rather poorly here, the flower was about 5″ crimson veined more

deeply colored with a star in throat, rays between veins were green, flower was latterly compressed. This flower picked up light from the back side of the segs from moon light which causes the interior of the flower to glow. It is possibly pollinated by a night flying insect. This species is considered to be *A. correiensis compressa.*

Species 14-62 which was sold as *A. cybister* has been identified by Dr. Traub as *A. maracasa,* an orchid flowering type. It does not do well here; however, with cultural changes this season it is doing much better.

Species SA62-1 appears to be *A. espiritensis.* However the photograph sent along with SA2-2 appears to be this species. The tag on this lot was evidently mixed when collected. Flowers that bloomed for me have been porcelain rose with green white throat. I have just received a second batch of these which has just flowered. The bulbs are about 1¼″ to 1½″ in diameter. The flowers are small type *A. belladonna.* Some appear to be very much like a form that is sold is "*A.* equestris" in India and which Dr. Traub has named *Amaryllis mostertii.*

Lot SA62-2 appears to consist of at least two species. This batch of bulbs comes from Esperito Santo, Brazil. I believe the majority of these bulbs are *A. apertispatha* as flowered and photographed by Sam Caldwell of Nashville, Tennessee. He describes it as follows: Scape 18″ tall, 2 flowers open, flowers 6¼″ top to bottom, bottom segment narrowest of all, clear salmon with white and greenish center. Scape grew with spathe valve open from start. Spathe valve looked like two green leaves starting up and the flower buds were visible as soon as spathe pushed out of ground. This is undoubtedly *A. apertispatha.* Bulb was in good leaf at time of bloom. I dug mine in two seasons and lost the largest bulbs. One flowered. It was definitely of the *A. striata* alliance.

My collector sent a photograph of this species and it appears to be *A. espiritensis.* It appears that SA62-1 and SA62-2 were mixed when collected.

Species SA62-3 is considered to be *A. striata Crocata* but appears to be difficult to flower. I had several flowers the first season but none since. The flowers were large, up to 7″ across, very waved of light pink and yellow pastel color and very beautiful. The photograph furnished by the collector shows the same type. I will have to give this one more special care to get it to flower.

SA62-5 from reports and photographs sent me appears to be a form of *A. striata;* however, it has not been robust with me and I will have to change my culture in order to save this introduction.

Species SA62-6 appears to be a form of *A. striata* var. *striata* with flowers of intermediate size about 4″ to 5″ of reddish orange color. This species also does not grow well for me.

Species SA62-7 is the true species *A. blumenavia* with very small white striped lavender flower with up to 7 flowers per umbel.

Species SA63-11 turned out to be three different bulbs. One is a *Hymenocallis* with a semi-petioled leaf, and which makes four flowers per umbel, a nice evergreen type. The second is a *Crinum* of which I

have no flower as yet, but Dr. Traub has flowered it and has named it *Crinum brasilense*. The third is an *Amaryllis* that has not flowered and the same area as SA63-12; from its growth it appears to be a form of *A. striata fulgida* like SA63-12.

Species SA63-12 is no doubt *A. striata fulgida*. It grew well the first year but like all *A. striata* gets too fleshy if over fertilized and many rotted in storage. I hope to again have flowering size bulbs to observe next season.

Species LM63-1 is from San Martin, Peru. It is *A. reginae*. There are some bulbs of a pink form among them. The flowers are identical except in color, the red fades to pink or light rose.

The above report covers most of the unidentified species I have collected which have flowered. At the present writing I have many that are making fine growth and hope I can report that these have flowered by next season. I am particularly waiting to see *A. cybister spectabilis* flower. I have one which has two spikes starting up at this time.

AMARYLLID CULTURE IN THE PACIFIC NORTHWEST

Andrew H. Grubbs, *320 Robert Av., Richland, Washington*

Washington's Columbia Basin, east of the mountains, is far from an ideal spot for the growing of *Amaryllis* and other amaryllids. During the summer excessive heat and dryness prevail. In the winter short, very dark cloudy days have to be reckoned with.

For me these conditions are partly controlled and only a fair degree of success has been achieved; that is, some years have been very rewarding and some have been much less than satisfying. It is not unlikely that a well equipped greenhouse with automatic heating, cooling, ventilation and humidifying would provide excellent growing conditions, even here.

For hybrids of my own crosses I have been using the system of growing in out-door beds in summer and dry storing in winter. With some limitation this is a satisfactory substitute for a more adequate greenhouse. Limitations I have encountered are: a season of bad weather can result in no blooms or scattered blooming; an unexpected early freeze can cause damage, losses or total loss. I have not had any losses of my own from early freezing but I have often dug them when they could have benefitted from six to eight more weeks for growing and ripening had I not been afraid of early freezing. With a storage area that can not be kept cool many bulbs will put out buds in April and if they are not put in the bed within a week or two the buds will not open when they are planted out. The hazards to bulbs due to insects, diseases and other accidents are much greater in out-door beds than in the greenhouse.

My two major misfortunes were, first, rather heavy losses from the *Narcissus* bulb fly and later more devastating losses from the Mosaic disease. The *Narcissus* bulb fly is now under control. The bulbs are all soaked for ten minutes or longer in a solution containing one table

spoon full of Aldrin in a gallon of water as explained in the "Amaryllis Manual" by H. P. Traub. Mosaic disease was first suspected from symptoms described in the same manual and was confirmed by sending some of the bulbs to Beltsville, Maryland where a study was being made by Doctor Robert P. Kahn. The result of the study was reported in "Plant Life" in 1963. Dr. Kahn reported the disease as Cucumber Mosaic Virus, a disease difficult to control on amaryllis grown out-doors because it is hosted by more than two hundred plants including many vegetables and weeds. I keep my beds as free of weeds as possible and spray as often as I can but unfortunately the beds are near the vegetable garden where tomatoes, cucumbers and beans are grown and I must dispose of every *amaryllis* that becomes marked as I suspect the plants mentioned are among the worst offenders as hosts.

Up to the present time, I have made about fifty crosses of *Amaryllis* using named Dutch clones, American hybrids, *A. evansiae*, *A.* x *johnsonii*, *A. belladonna* L., and making further crossings among the seedlings that resulted. The net result was a very pleasing display of flowers ranging from five to eight inches in diameter and in colors of red, orange and pink. There was a great variety of red shades, stripes, spots and borders. Most of these bulbs grew more easily than the Dutch hybrids, bloomed sooner while the bulbs were comparatively small. Many never did have bulbs as large as the Dutch hybrids and those that did have comparable size were among the least pleasing in color and shape.

It is probable that none of my clones was good enough, or different enough from clones already named and on the market to be introduced. I have never lived in an area where *Amaryllis* are common and I have never attended an Amaryllis show. All of my opinions hinge on the clones I have bought, pictures I have seen and information found in books and so it is probable that I am unable to judge properly just how good or different a clone is.

A large part of my collection was lost due to the mosaic and I do not know what those coming on will be like. If there is any lesson to be learned from my experience with mosaic, it is to not try to save any suspected clones. I was very reluctant to destroy any of my favorites before they were so badly marked that there could no longer be any doubt about their diseased condition. I was reluctant to destroy a good sized bulb that had not bloomed for fear it might be the unusual one I have been waiting for and so a source of infection was harbored where it could do the most harm.

I have numerous seedlings of crosses between *A. belladonna* L. and *A. evansiae*. These plants are in size, appearance and growth habit very much like *A. evansiae*. They do not seem to have acquired any hybrid vigor. When soil and drainage are not just right they are subject to root rot or the whole bulb may rot if the condition is not corrected. They will not grow out-doors in this locality. One of these bloomed early last spring. The flower was just like *A. belladonna* in size and shape. The color was a faded looking red, looking as if it had submerged stripes. The effect was not at all pleasing.

Crosses between *A.* x *johnsonii* and *A. evansiae* look and act just like those of *belladonna* X *evansiae*. None have bloomed yet. My methods of growing these may not be right. I have never tried letting them go dormant in the winter as they appear to be evergreen species. Perhaps they would benefit by a period of complete dormancy.

Eight seeds of the so called Blue Amaryllis, *Worsleya rayneri* were planted in 1957. All of them germinated easily and grew well for several months then I began losing them one at a time. I tried many different soils, fertilizers, temperatures and light variations. None of them did any good and I thought perhaps by trying too hard I was killing them with kindness and I let them alone with the same treatment the other plants were getting. One bulb survived and I put it in the out-door bed thinking Mother Nature might do something for it. In the fall I dug it and found it without roots and weaker than ever. It was again potted up in a four inch pot with plenty of drainage material at the bottom. A loose porous soil mix, to which was added a small amount of ground rock, and greensand and phosphate rock, and a pinch of trace elements. There is now some improvement. The neck of the bulb is five or six inches above the soil, the leaves are twelve or more inches long and fairly healthy looking. The bulb itself is probably about the size of a hickory nut.

Seed of *Amaryllis aulica* acted just like *Worsleya* except that they grew well from time to time and then a period of decline set in with losses until only one of these remains.

My latest addition is a bulb of *A, psittacina,* which has started off just like any other hybrid would and from appearances I do not expect any trouble with that one. It was planted this past autumn and already has an offset coming up beside the mother bulb.

Of other amaryllids I have tried to grow I will only make brief mention. Two *Hymenocallis* bulbs identified only as "Spider Lilies" grow like hybrid *Amaryllis* and the plants, when not in bloom, look just like *Amaryllis* among which they grow with the same care. When they bloomed they excited considerable interest and admiration because they were new and unusual to the people, who were seeing them for the first time. They interest me and sometime I will get some that are identified as to species.

For *Amaryllis* and amaryllids I have a shaded bed, about the same thing as a lath house. In this bed one bulb of *Lycoris squamigera* has grown for several years. It is winter hardy and has bloomed several times. This year it has set seed. I pollinized some florets with pollen from an *Amaryllis* that happened to be blooming but did not emasculate them nor screen them and so likely they were pollinated again by bees.

A *Crinum* 'Cecil Houdyshel' grows weakly and blooms half heartedly each year. It seems to be infected with mosaic but as it is away from the *Amaryllis* I have not destroyed it yet. The spots on it are less pronounced and not dark and waxy looking as are the blotches on some *Amaryllis*. Perhaps it is some climatic condition or cultural practice that it has not had time to adjust to.

Nerine bowdenii was tried in the greenhouse for three years with no success and now they are growing out of doors, where they seem to be winter hardy and they may in time establish themselves and give blooms.

Among seeds sent to me for trial here were: *Habranthus robustus, H. brachyandrus* and *H. texanus.* All of these were started from seed, grew easily and bloomed both in the greenhouse and out of doors, but only *H. texanus* seems to be reliably winter hardy. The others drop seed which will come up the following spring. I dig the bulbs in the fall and store them over winter. They are planted outside again in the spring.

Members of the genus *Rhodophiala* have not done very well in the greenhouse and most of them did not survive a winter outside. A few bulbs remain and I think they are *R.* x *huntiana.*

I can report real success with one other packet of seeds I received and that is *Littonia modesta*, a member of the climbing lily tribe. The seed grew easily and the bulbs or tubers multiply rapidly. Some left in the ground survived. Dropped seeds also come up in the spring. These in themselves are not especially desirable as an addition to the flower garden, but as was suggested they might be crossed with *Gloriosa* species, and this I may try when and if I get a chance.

AMARYLLIDACEAE NEEDED FOR CELL DIVISION STUDIES *

Wm. T. Jackson,
Department of Biological Sciences,
Dartmouth College, Hanover, N. H.

Endosperm cells contained in young seeds of the African Blood Lily (*Haemanthus katherinae* Baker) have been used for several years in cine-micrographic studies of cell division. The most complete description of the technique used in preparing endosperm cells for study is given by Mole-Bajer & Bajer (1963). The virtues of this particular species of *Haemanthus* for such studies can be summarized as follows:

1. The endosperm cells are suspended in a liquid in young seeds and the cells do not possess cell walls at this stage. Consequently, the cell-containing liquid can be squeezed from the cut seed onto an agar surface for easy microscopic examination.

2. If the excess liquid is drained from the agar surface the cells remain attached to the agar and flatten as surface tension of the liquid film covering them increases. Therefore, the chromosomes are spread into a monolayer during mitosis.

3. The cells undergo normal mitosis on the agar surface and the process is completed with a few hours. (It should be kept in mind that endosperm is a 3n tissue).

4. The nuclei are large (50 to 75 microns or even more in diameter).

* This work was supported by a grant from the National Science Foundation, GB 704.

The haploid chromosome number is 9. The chromosomes are large (4 microns in diameter and up to 100 microns in length during anaphase). The thickness of the cell when flattened for study is 6 to 10 microns.

5. Relatively few starch grains are present in young seeds, thereby permitting precise studies of changes in birefringence with the polarizing microscope.

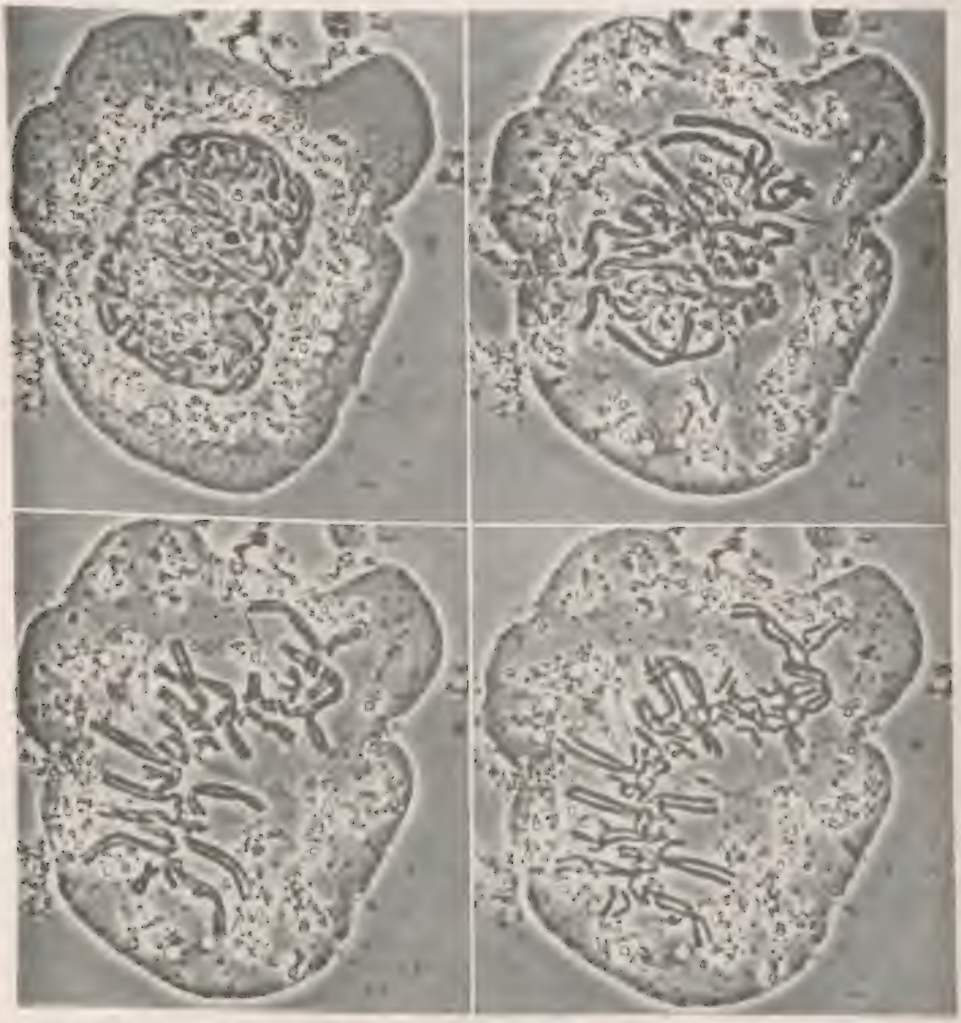

Fig. 21. Stages of mitosis in an endosperm cell of the Katherine's **Haemanthus** (**H. katherinae** Bak.) observed by phase contrast microscopy. **upper left**, prophase; **upper right**, prometaphase; **lower left**, metaphase; **lower right**, onset of anaphase.

Time in minutes from prophase; to prometaphase, **110**; from prophase to metaphase, **170**; from prophase to onset of anaphase, **190**. Continued in Fig. 22.

6. The cells will undergo division on a very simple medium (3.5% glucose + 0.5% purified agar is used routinely). However, at present, they will not continue to divide under these conditions.

7. A single seed usually contains several hundred cells in all stages of division. Therefore, one has ample opportunity to select particular stages for study.

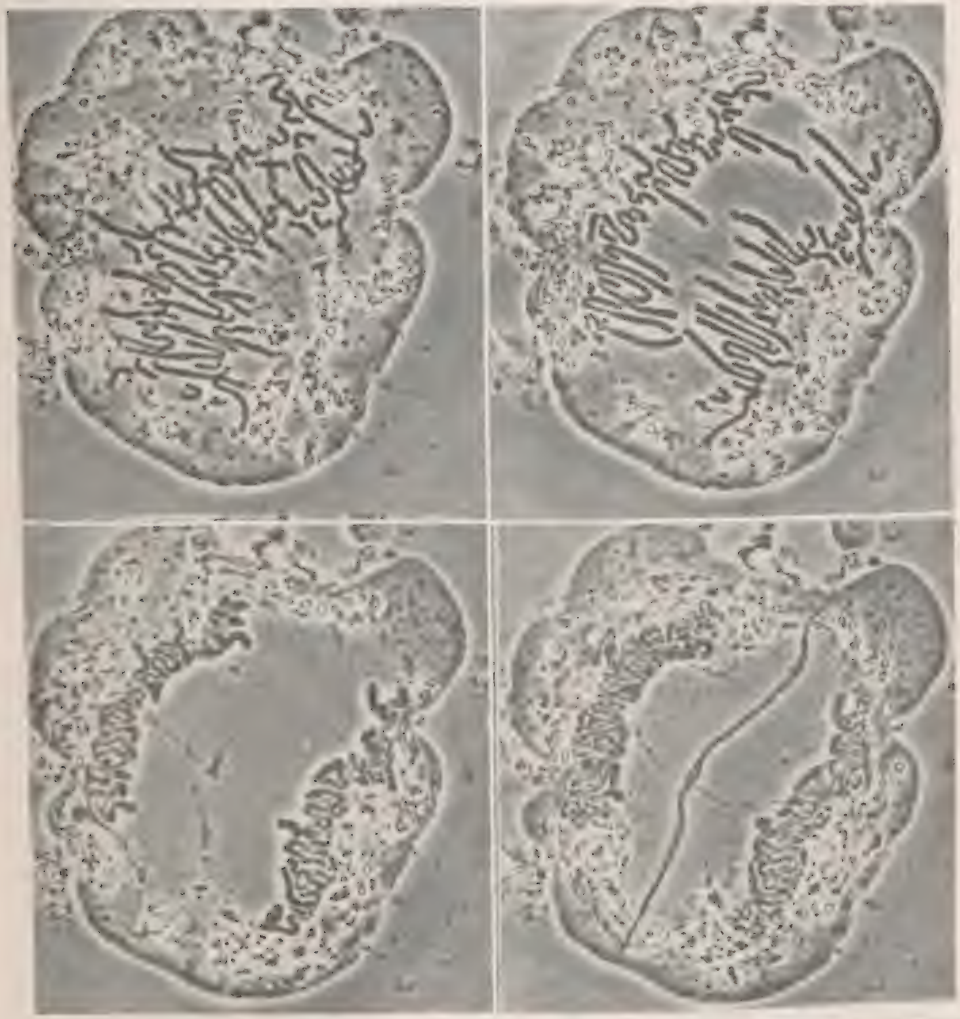

Fig. 22. Stages of mitosis in an endosperm cell of **Haemanthus katherine** Bak. (continued from Fig. 21) **Upper left**, mid anaphase; **upper right**, late anaphase; **lower left**; early telophase; and **lower right**, late telophase.

Time in minutes from **prophase** (in Fig. 21) to mid anaphase, **200**; from phophase to late anaphase, **220**; from prophase to early telophase, **240**; and from prophase to late telophase, **270**.

8. A single fruit contains one to three seeds, and a single plant of *Haemanthus katherinae* annually bears an inflorescence containing up to 100 single flowers. These fruits ripen over a three to five week period. Therefore, a single plant provides material for study for several weeks.

9. Although the plant normally flowers in the Northern Hemisphere during June and July, time of flowering can be controlled by holding the plant dormant or by breaking dormancy prematurely.

10. The plant is easily propagated from seed or offshoots, but it does require three to six years to reach maturity. In Europe, the plant is readily available commercially. It is less common in its native habitat of South Africa. It is not common in the United States, but it can be grown quite successfully outdoors in Southern California.

11. The plant, particularly the inflorescence, is striking and makes an excellent addition to a greenhouse. It requires very little care.

Unfortunately, very few species of plants have been examined for their suitability for *in vivo* cytological investigations. Of the species examined to date, members of the Amaryllidaceae have proven most promising. Therefore, we are undertaking an intensive examination of as many genera of this family as possible. We are most anxious to exchange mature bulbs, fruits, or seedlings of *Haemanthus katherinae* or *H. magnificus* for the same of other species.

If you are able and willing to send plant material (on an exchange basis or we will pay shipping charges), please send a *list* of material available to: Dr. Wm. T. Jackson, Department of Biological Sciences, 406 Gilman, Dartmouth College, Hanover, N. H. 03755 (U. S. A.)

The stages of mitosis in an endosperm cell of Katherine's *Haemanthus* (*H. katherinae* Bak.), observed by phase contrast microscopy are shown in Figs 21 and 22. Time in minutes:

prophase to prometaphase, 110
prophase to metaphase, 170
prophase to onset of anaphase, 190
prophase to mid anaphase, 200
prophase to late anaphase, 220
prophase to early telophase, 240
prophase to late telophase, 270

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ARTIFICIAL POLLINATION OF HAEMANTHUS KATHERINAE *

WM. T. JACKSON,
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Dartmouth College, Hanover, New Hampshire, U. S. A.

Mole-Bajer and Bajer (1963) have emphasized for many years that the endosperm cells of several species of plants are suitable for *in vitro* studies of mitosis, and that the African Blood Lily (*Haemanthus katherinae* Baker) combines the most desirable characteristics of all species examined. During the so-called "milk stage" of endosperm development free nuclear and single cells without cell walls can be found. The chromosomes are large and identifiable, being about four microns in diameter and up to one hundred microns in length. Although endosperm is typically triploid, haploid (n=9) as well as polyploid cells are quite common. If a suspension of endosperm cells from the developing seed is spread on an agar surface (0.5% purified agar plus 3.5% glucose in glass distilled water) and enclosed in a saturated atmosphere, the cells will flatten spontaneously, and mitosis can be followed easily with the microscope (Bajer and Mole-Bajer, 1954, 1961, and Inoue and Bajer, 1961).

Even though cultivation of this plant began in 1877, it is rather uncommon in gardens and greenhouses and is becoming rare in its native habitat. Three to six years are reqiured to obtain a bulb of flowering size from seed or offshoots. The mature plant normally flowers only in late spring or early summer, thereby restricting the period during which young seeds can be used for studies of mitosis. Fruit set is so poor under natural conditions that an inflorescence containing as many as a hundred flowers may produce fewer than ten seeds.

We are attempting to determine the factors controlling (a) time of flowering and (b) fruit set. When this is accomplished, we should be able to space the time of flowering of a group of plants so that some will be in flower throughout the year and we should be able to control fruit set so that each inflorescence will provide a large supply of developing seeds. It is the purpose of this note to describe a simple, rapid, and highly effective pollination procedure that results in a high percentage of fruit set.

Mole-Bajer and Bajer (1963) recommend that the flowers be hand pollinated with a camel's hair brush. This is a tedious and time consuming process resulting in about 30% fruit set. A fruit that sets will contain one to three seeds. We have found that if one simply gathers together the flowers of the inflorescence with one hand, and rubs the heel of the other hand over the exposed anthers and stigmas, pollination is effected. A large collection of plants can be pollinated within only a few minutes, and cross pollination is insured. This procedure is repeated daily.

* This work was supported by a grant from the National Science Foundation, GB 704.

Records were kept on nineteen plants growing and flowering in the greenhouse. The average number of flowers per inflorescence was 96 with a fruit set of 80%. The African Blood Lily possesses a trilocular fruit that contains only one seed per locule. Of the nearly 1300 fruits examined, 59% contained one seed, 34% two, and only 7% had a seed in each of the three locules. The first seeds in a given inflorescence reach the proper stage for study in about three weeks after anthesis begins, and the last is ready three weeks later. Therefore, a single plant will provide about 90 seeds spread over a three week study period.

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Mole-Bajer, J. and A. Bajer. 1963. Mitosis in endosperm. La Cellule 63 (3):400-407. (with 3 plates).

FURTHER NOTES ON USE OF CYGON

Prof. F. S. Morishita, of the University of California at Riverside, Calif., writes, under date of Aug. 11, 1964.— Cygon has been used quite regularly by many of the commercial nurserymen in southern California.

I would like to suggest that you try Cygon as a drench. This method seems to work the best for most people. The dosage would be 1:1600 (this would be about ½ teaspoon of Cygon 2.67 per gallon of water), also, a drop or two of some type of sticker-spreader should be added. Do not expect immediate results from this treatment. From our experience with this material used in this manner, we have found that it will take about three to four weeks before you start seeing some results. I think that it would be advisable to try this treatment on a few of your plants to see the phytotoxic effects of Cygon.

AMARYLLIS FROM SEEDS UNDER ARTIFICIAL LIGHT

Richard J. Sudd, *750 South Cavan Lane, Des Plaines, Ill. 60016*

The seeds of all *Amaryllis*, which I have secured, have given good germination under artificial light. The determining factor in most cases was the freshness of the seeds. The longer the seeds were kept in storage, the lower the rate of germination.

Over the years with the increasing number of *Amaryllis* bulbs, my growing area has become limited. Presently, I have some two hundred

seedlings growing in an area 30″ by 40″ (thirty by forty inches), with two industrial fixtures overhead. I have tried to limit the growing area to seeds of a few crosses of the small flowering bulbs, and some of the species. In some instances it was possible to obtain flowering bulbs within two years.

All the seeds I have grown under artificial light are planted in plastic containers. The largest size of plastic container is cylindrical in shape, measuring 7″ in diameter with a depth of 5 inches. This container is sufficient for a dozen seedlings for two seasons' continuous growth.

Those seedlings which were not planted out of doors, were transplanted in individual cylindrical plastic containers for continuous growth under artificial light. These plastic containers measure 3″ in diameter and 6″ in depth.

The basic growing media used for seeds and transplanted seedlings was coarse sphagman moss and vermiculate. In the larger size of container for seeds, a 2″ (two inch) layer of coarse sphagnum moss was overlaid by a 2″ layer of vermiculate. The seeds were planted in the vermiculate to insure good germination.

Those seedlings, which were not transplanted out of doors after the second season under artificial light, were transplanted in individual containers. The same planting procedure was followed, as in the larger size container. The seedling root system was carefully surrounded by fresh sphagman moss, with the bulb resting on and surrounded by a layer of vermiculate.

I started a program of fertilizing when the seedlings put forth their leaf growth. A soluble fertilizer "Hyponex" (7-6-19) was alternated with muriate of potash every second week, and a temperature of 70 degrees was maintained in the growing area.

The light source has remained the same for seedlings as mature bulbs (see Plant Life 1964, pages 111-115). A minimum of twelve hours of artificial light at a height of twelve inches is given the seedlings the first year of growth. At the end of the second year, the height of the light source was increased to eighteen inches to allow further growth of the leaves.

I have not carried out any breeding program with any idea of creating new recombinations within the amaryllis hybrids. However, I do believe a change would be welcomed in the small flowering amaryllis, i.e. greater color variety. Probably working with *Amaryllis blumenavia* would be a step in the right direction, but as everyone with an interest in the field of breeding knows, obtaining a working stock is very difficult. I hope in the near future more of the new species will be made available.

MORE ON GERMINATING AMARYLLIS SEEDS IN WATER

PHILIP G. CORLISS, M. D., *Arizona and California*

Until 1964 my plant originations (Spuria and Louisiana Iris, Hemerocallis, etc.) were introduced by other nurseries. Since it became necessary on account of my health to abandon my gardens in Arizona and to move my operations to San Diego, I put out a little catalog in 1964. My most successful efforts with amaryllis were in three lines: (1) doubles for field culture, (2) *A. striata* hybrids, and (3) a strain with a white picotee edge. I offered bulbs and seeds of these strains.

A customer from the southeast wrote me that she had poor germination with my amaryllis seeds, although she used procedure that had been previously successful. I sent her a replacement order and then decided to ascertain if something might have impaired the viability of my seeds, which had been shipped as soon as harvested and dried.

The method of germinating seeds in water as reported by Mr. Darold Decker in Plant Life (1964) appealed to me, since I would not be in constant residence in either Arizona or San Diego; and the inability to depend on caretakers to keep seed beds properly cared for during the vicious Arizona or the rain-free San Diego summers posed a problem. The gratifying results of my experience will, I hope, encourage others to use this method.

Having owned many cats for many years, I had acquired some years ago a rather extravagant number of clear plastic dishes offered as premiums by the Puss 'n Boots Company. These dishes are roughly 4½ inches in diameter and something under three inches in depth. The tightly fitting top section, which is about 1½ inches deep, overlaps the base section by ¼ inch. These dishes were washed with hot water and the lower section filled to a depth of ¾ inch with San Diego tap water.

In half the dishes I used a fungicidal powder provided by a leading chemical company. In the other half I used Lavoris (suggested by Mr. Decker) in amount sufficient to color the water a rather deep pink. Seeds were floated on the water to cover the entire surface but not to overlap. The Lavoris-treated dishes developed no mold, while most of those in which the powder was used became badly contaminated. In all "plantings" now I am using only Lavoris.

Germination of the amaryllis occurred in from ten days to ten weeks and was better than 50% despite the age of the seeds. The mortality of seedlings pricked out into flats and ferti-pots has been high, but that is due to my inexperience as a pot-grower, I am confident.

Having succeeded with the amaryllis, I am following Mr. Decker's suggestions to try other plant material. *Hemerocallis*, all kinds of iris, various amaryllids and irids, and even seeds of zapote and papaya are under test.

Mail address: (mail to Somerton will always be forwarded . . .)
P. O. Box 10502, San Diego 10, California 92110
New Garden (and mail) address:
2753 Ocean Front Walk San Diego 8 (Mission Beach), California 92108

GROWING AMARYLLIDS IN NORTH FLORIDA

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Jacksonville, Florida 32204

Numerous correspondents throughout the country and readers of Plant Life have written to inquire how I raise my seedling *Amaryllis*, and in order to furnish this information most advantageously this article is being written to describe my methods in the North Florida area.

First, in June when the seeds are generally at their peak of ripeness, I gather them and plant one-quarter inch deep in a mixture of coarse sand and granular peat, in which has been previously mixed ground limestone, cottonseed meal and bone meal. Seeds may be planted flat, or on edge, whichever one may prefer, but it is important that they not be crowded and overlap each other, and the planting mixture should be firmed around the seed. Coarse bagging is placed over the seeds and a light watering is given with some soluble fertilizer solution. All seeds are planted in wooden flats. A good idea to make the flats last longer than one season is to soak them some time in advance of planting in used motor oil. This assures a strong and easily managed flat during all of the growing season, as well as assuring another season's use. Flats are placed on corrugated sheets beneath the benches in the greenhouse out of the direct sun, and very shortly the seeds sprout and make a vigorous growth. At this time the bagging is removed. Bulblets are kept growing in the flats through the remainder of the year, and until the next March, at which time each bulb has from three to five leaves, are the size of a marble, and are ready to plant out as individuals in separate pots. The pots are placed out of doors in shade during the summer months, and are brought back under cover in the fall. I use four-inch clay pots for the first transplanting and six-inch pots for the second transplanting after the bulbs have grown for two years. Six-inch pots will enable you to retain the growing bulbs for several years without further repotting. Plants may be kept growing much longer each season by continuing to bring them inside before cold weather starts.

Where large bulbs are dug out of the garden, or may be purchased in season, I start with a six or seven-inch clay pot. I make the soil mixture equal parts rotted leaf mold (woods soil) or granulated peat, topsoil from garden and sharp sand. Well rotted dairy or chicken litter fertilizer if available, or commercial sheep, and one good handful of bonemeal per pot, are added.

The bulb is set in the pot with roots well spread out, leaving neck and one-half of bulb outside of planting soil. Water with lukewarm water to settle soil. Keep inside house where pot will receive average heat of 70 degrees during day, and place near window to obtain some sunlight if possible. The inside heat will enable bulb to bloom sooner.

The bulb can continue to grow in the pot after blooming, but when warm weather comes, it should be taken out of doors, and the pot with

Fig. 23. Beckwith D. Smith, of Jacksonville, Florida, and some of his choice hybrid *Amaryllis*.

bulb in it sunk in the ground, where it can get sun and natural moisture that promotes root growth. Partial shade is best. Fertilize lightly and water lightly once a week during the spring and summer growing seasons. It is necessary for leaves to grow, as well as roots, so the bulb can store up enough energy for next year's bloom.

While in the house, when leaves appear, turn the pot occasionally as the leaves will always try to lean toward the light outside. When bloom appears, tie bloomstalk lightly to bamboo or wooden stake for support. FEEDING: You may use any good soluble fertilizer or fish oil emulsion. OUTDOORS: Mix cottonseed meal or bonemeal in the outdoor planting soil.

Take up bulb in fall when leaves die down, bring inside and allow to dry off until ready to repot. Always preserve roots. Repot in fresh soil when ready to grow on in house, repeating the above cycle.

I am now growing seedlings from crosses made from blooms on the original A. C. Buller *Amaryllis* exhibited for the first time in U. S. at the Atlanta Flower Show, April, 1963. I hope that some of these will produce flowers of rare and distinguished beauty. Who knows? Perhaps they may.

WORSLEYA RYANERI FROM SEEDS

Reports on the growing of *Worsleya rayneri* from seeds were included in the 1964 and 1965 issues of PLANT LIFE. Mr. Clouette presents his third report below. Others are requested to report their experiences with this difficult subject in future issues.

5. THIRD REPORT FROM MR. BURR CLOUETTE (CALIFORNIA)

Only one of my two seedlings from Dec. 20, 1962 survives. It is growing well and has always been quite thrifty. It is planted in Black Magic potting mix in a 4-inch plastic pot. The use of plastic pots seems advisable because *Worsleya* resents drying out. The bulb is now about ⅞-inch in diam., and is 1/3 out of the planting mix, the neck 3 inches long, and about ½-inch in diam. At present it has four mature leaves, and one just about 1-inch long emerging. The mature leaves are 6—8 inches long.

Of the five seedlings given me by Dr. Traub, four are surviving. Two are in my care and two are being grown on in the greenhouse by William Craig on the Campus of Southwestern University, San Diego, Calif.

The two I have vary greatly from the one that I raised, although they are approximately of the same age. One is slightly—over 1-inch in diam.—with a shorter neck 1½-inches long, and a neck diameter of ⅝-inch. It carries seven leaves. The other is much smaller. The bulb is about ½-inch in diam., neck 2 inches long, and ¼-inch diameter. It has 4 smaller leaves. Both of these bulbs share a 5-inch plastic pot, containing Black Magic potting mix.

On April 21, 1965, I floated some *Worsleya* seeds on tap water. Twelve had germinated by May 20, 1965, and had leaves starting. As I was moving again, I transplanted them. Two did not contain chlorophyll and of course died. As of June 10, 1965, ten fine, thrifty seedlings are surviving, and some are already forming the second leaf.

GROWING AMARYLLIS IN THE NORTH

JOHN J. SCHAEFER, *Dayton, Ohio*

Growing amaryllis in the northern states can be enjoyable and profitable depending on whether you are growing them as a hobby or as a means of livelihood. Of course, when I speak of *Amaryllis* I am referring only to the American species, which are sometimes erroneously listed under the synonym, "Hippeastrum".

Amaryllis growing presents quite different problems in the north than they do in the south, where they usually receive a more natural treatment depending on climate and soil. The closer one comes to a perfect climate and soil conditions the better. Since *Amaryllis* are not hardy here, one must protect them against cold by artificial means. This requires a greenhouse or a home. I have tried both.

In a greenhouse one can control the conditions quite well. Temperature and humidity can be controlled fairly well although the problem of air circulation is a difficult one. In the home it is still more difficult, since one must maintain, first of all, conditions more suitable to man himself than to his *Amaryllis*. The proper soil conditions may be obtained by selecting a suitable potting medium mixture formula.

In the Southeast the soil is usually loose, and porous, which permits the water to filter through at a fast pace. Porosity of the soil is important, and this importance can be noticed when one removes carefully a recently potted Amaryllis bulb from a clay pot and notices how the roots are mostly clinging to the sides of the pot to obtain air through the porous clay. I do not believe that I have ever read any reports of porosity tests with amaryllis, or any other flower, for that matter, but I do believe some reliable worker, with more space than I have available, should make tests to determine the value of porosity on amaryllis. The results may also have a bearing on the blooming and the fertilizing program.

Much of my young life was spent in a greenhouse, as my father was a florist. I learned to grow many flowers in a greenhouse, but none in a home. My father's first love was amaryllis, and I have inherited that love from him. When I left the greenhouse, the one thing I wanted to grow in my home was amaryllis, but growing flowers in a home is not like growing flowers in a greenhouse. I had heard many complaints of buyers who couldn't get their amaryllis to grow as we did in the greenhouse. I set out to determine what the problems were when growing amaryllis are grown in a home, so I planted many of

the best bulbs available, that could be handled at home, (My wife still thinks I have too many, except when they're blooming,) and I have been raising too many ever since.

I found out that most people who grew amaryllis in the home did not pay attention to the exacting instructions given them with the bulbs. Every word written on the instruction sheet is important, or the space would not have been used to print it, and every little instruction disregarded has a bearing on the vigor with which amaryllis grow.

When my father was in business we used to ship amaryllis to Detroit, Michigan. All shipping was done while they were in bud, as amaryllis blooms bruise easily. Nowadays I never ship amaryllis as cut flowers in this city or any other. They were used in baskets, sprays and other funeral arrangements as well as pot plants. I mention this because the present is another time in which experimentation should be carried out by the commercial grower and florist on the shipping and use of amaryllis as cut flowers.

One more thought about amaryllis. NEVER call them lilies. My father would have reprimanded anyone who did so, and so will I. But you must try raising amaryllis in your home. AMARYLLIS ARE FUN.

THE SANTA CATARINA ISLAND CRINUM MOOREI

L. S. Hannibal, *Fair Oaks, Calif.*

Several years ago Robert Goedert imported a number of Crinum from Santa Catarina Island off the coast of southern Brazil (City of Florianopolis, Ilha de Santa Catarina, State of Santa Catarina). To date five different bulbs have been released by number. Two turned out to be *powellii* hybrid types, one a *C. americanum* or *strictum* and the final #24 a *C. moorei* variation. Normally we would pass up reporting these plants but Claude W. Davis has found the Santa Catarina Island bulb better adapted to Gulf Coast conditions than the *moorei* forms normally in circulation. The blossoms have heavier substance and the root system is extremely vigorous. Previous to opening the blossoms have a faint odor of green walnut husk, and the seeds have longer radicles than a typical *moorei*. Otherwise there is no way to distinguish between the type and #24.

The writer was inclined to accept it as a new South African or South American form until he flowered a Drysdale hybrid between *C.* x *powellii album* and *C. moorei*. The similarity in flower substance and other habits now suggests that the Santa Catarina Island bulb is a F-2 or similar hybrid obtained by a *C.* x *powellii album* crossing on a *C. moorei*, a cross that could have occurred naturally under the humid conditions at Santa Catarina. The fact that other hybrids including two *powellii* turned up from this area may substantiate the conclusion.

Santa Catarina Island was a popular supply base during the days of the Clipper Ships and practically everyone passing around the Horn

would stop there coming or going. Similarly, ships in the slave trade between Africa and Brazil often made this a port of call, so we still have the possibility of an African import, despite the fact that some wealthy estate owner may have imported a collection of Crinums from a Florida grower. It is hoped that the seedlings will disclose whether the plant is a hybrid. In the meanwhile it is a welcome addition to southern gardens where the common *moorei* flowers so poorly.

PLANT LIFE LIBRARY—continued from page 70.

FLOWERS FOR THE KING: THE EXPEDITION OF RUIZ AND PAVON AND THE FLORA OF PERU, by A. R. Steele. Duke University Press, Durham, N. C. 1964. Pp. 378. Illus. $10.00. The first nine chapters of this interesting book are devoted to a brief sketch tracing the development of interest in plant science, including lineagics, in Spain during the 18th century, and to the telling of the story of the South American plant exploration trips of Ruiz and Pavon, and their French collaborator, Dombey. The remaining seven chapters deal with the until now unexplored subject of the partial publication of the projected "Flora of Peru". It was intended that this series should include the results of the South American expedition of Ruiz, Pavon and Dombey. However, due to the all too human behavior of Ruiz and Pavon and their contemporaries in Spain, France and England, only part of the results were published. It is a story that all interested in plant science must read as an object lesson, and Dr. Steele is to be congratulated on this important contribution to the history of lineagics. Most highly recommended.

OVERTURES TO BIOLOGY: THE SPECULATIONS OF THE 18th CENTURY NATURALISTS, by P. C. Ritterbush. Yale University Press, New Haven, Conn. 1964. Pp. 287 Illus. $7.50. The author explores the ideas of the 18th century naturalists on the basis of two beliefs: (1) that "electricity was the most important agent in the economy of nature, sustaining life and perhaps its principal physical cause", and (2) that plants were analagous to animals because of their close proximity in the scheme of nature". He explains the long delay in establishing *empirical* and experimental procedures as due mainly to such *deductive* reasoning. The author indicates that the empirical approach was first exhibited to a minimal degree by John Hunter (1728—1795), and some others. This contribution to the history of biology is required reading for all biologists.

CATALOGUE OF THE LIBRARY OF THE BRITISH MUSEUM (NATURAL HISTORY). London. Vols. 1—5 (1903—1915); Supplements, Vols. 6—8 (1922—1940). Facsimile Reprints. Verlag J. Cramer, Weinheim, Bergster., Germany, 1964. Price DM 672. At the British Museum (Natural History) there is maintained one of the great and most complete collections of books, including periodicals, manuscripts, maps and drawings pertaining to Natural History—Botany (plant science), zoology (animal science), geology and mineralogy. This reprint edition now makes this important author catalogue available to the many all over the world who cannot consult it personally in London. The Catalogue is especially valuable to students of natural history, and to bibliographers generally. Highly recommended.

HOLIDAY FLOWER ARRANGEMENTS REVISED, by Emma H. Cyphers. Hearthside Press, 381 Park Av., S., New York, N. Y. 10016. 1965. Pp. 129. Illus. $4.95. This revised edition of a well-known book on flower arrangements will be welcomed by homemakers. The subject matter is arranged by holidays—Thanksgiving, Christmas, Easter, etc.; and other occasions—as in the first edition. Highly recommended.

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1965 MEXICAN EXPLORATION TRIP

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As in previous years, the writer again invaded the interior of Mexico in search for new and rare bulb material. The first half of the trip was a repetition of the trip made in 1964, from San Antonio, Texas, to Mazatlan, Sinaloa, via Monterey and the city of Durango. My companion was again Chris Abee, a student, and we chose mid- to late July in order to pick up some of the later flowering plants. This proved to be a wise decision; it allowed us to find things in flower and in leaf that we might have missed had we been two weeks earlier. After leaving Mazatlan, we drove southward to Tepic and then turned eastward to Guadalajara, as before, but then we entered new territory (for us) when we made a loop southward to Manzanillo on the Pacific coast and returned to Guadalajara by way of Colima. From Guadalajara we drove northeastward to Leon, Guanajuato, and then turned southward again to Morelia, Michoacan, and then eastward to Toluca. From there we drove south to Taxco and Iguala before turning homeward by way of the Pan American Highway. The trip took ten days and covered more than 4000 miles. Except for one inevitable blown-out tire, we experienced no mechanical problems and everything went very smoothly.

We left Saturday afternoon of July 10, 1965, arriving at Laredo in time for supper and the usual customs inspection. By driving all night while still fresh, we were able to cover the many monotonous miles of the Coahuilan desert without boredom. Early morning found us in the state of Durango, nearing Durango City, where we would eat breakfast. This was fine for us, since it is here that bulbous plants begin to get more interesting. Unlike the previous July trip of 1964, the country was very dry with only evidence of widely scattered rainfall, and stockmen of the area were complaining of possibilities of drought if the rains did not come soon. Thus we missed seeing the *Hymenocallis* species that we had found in flower a few miles east of the city of Durango the year before. The lateness of the rains had kept them from coming up. No doubt that they were getting impatient at that late date. It really did not matter though, as my own collection of the previous year had grown well under cultivation, so there was no need to collect more. After breakfast we continued westward and found it still dry and looking more like autumn than midsummer. We were lucky in finding a little violet-blue *Nemastylis* species in flower and stopped to dig a few. These resembled *N. tenuis* of northern Mexico, but the latter is a late afternoon bloomer, and these were clearly morning bloomers. A few miles westward we stopped to search for the golden yellow *Tigridia dugesii*. Though we returned to the same spot in which we had found them flowering in abundance the year before, we con-

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sidered ourselves lucky to find a tiny number after much peering on hands and knees. None were in bloom and it was obvious that the drought had inhibited growth. We found a few other odds and ends here—a small lavender *Oxalis*, a glaucous-leaved *Bravoa* species in bud, a small pink stoloniferous *Allium*, some scattered *Milla biflora*, a small yellow *Anthericum*, and a quaint little *Tradescantia* with grassy leaves and tuberous roots. A bit later we stopped at a spot where we had found a colony of *Sprekelia* in flower the year before, along with a species of *Manfreda*. Not a leaf of *Sprekelia* was to be seen. A few *Manfreda* were peeping above ground.

It is painfully clear that the presence or absence of seasonal rainfall can determine the success of any plant collecting field trip. Fortunately a few more miles and hours of driving brought us into greener, wetter, cooler country. There we found *Tigridia violacea* once more, flowering abundantly in low wet places at 7000 feet elevation. The dainty spotted flowers may be almost white with faint mauve-blue spots, but most of them are darker mauve-blue with heavy "freckles". Unlike the *Tigridia pavonia* hybrids of our gardens, the outer segments of this little *Tigridia* are spotted as well as the "cup" formed by the interior smaller segments. I collected these again, as experience taught me that they withstand drying out poorly after digging, and losses are apt to be high if not kept damp and replanted as soon as possible.

Maybe we brought luck to the state of Durango, or at least rain, for the entire afternoon was spent driving in a series of various forms of moisture—fog, drizzle, sudden showers, sleet, and even hail. Certainly this high mountainous country had all the outward appearance of a bleak wintry day—in July! I was pretty certain that there would be no more collecting for that day, and it gave us a good excuse to make fast driving time through this country, just as it had the previous year. I understand that in winter one may run into sudden snow storms in these mountains. Indeed, we passed through an area that had just had a sleet storm, and the ground was so completely covered with sleet as to give the appearance of snow.

Later in the afternoon we began the gradual, but dizzying descent to slightly lower mountainous country as we entered into the state of Sinaloa, and ultimately the coastal City of Mazatlan, where we would spend the first night's rest. I had now been without sleep for about 33 hours, and had been driving for about 24 hours. Surprisingly, I was not tired yet, but one does begin to look forward to a hot bath and a good nights rest! At Kilometer 1186 we stopped long enough to collect a *Hymenocallis* species akin to *H. speciosa*, with several petioled leaves and a smallish bulb. This one we had collected last year in flower, but now these had mainly completed flowering and were in fruit. The identity of this one is still a mystery and it may turn out to be a new species. Growing with it was a bulb-irid of the *Tigridia* group, but they were not yet in flower so identification was not possible. We dug a few anyway. In the same area we found some beautifully colored giant *Echeverias* with light green leaves heavily flushed with red. I usually

pass up succulents, but these were too choice to ignore. They are the largest species of *Echeveria* that I have encountered.

Dropping still lower in elevation into somewhat dryer country I found yet another species of *Hymenocallis* in leaf that I had overlooked the previous year. These were not yet in flower, but the broad glaucous leaves suggested a relationship to *H. choretis* and its allies. The finding of this type of *Hymenocallis* in this part of Mexico only served to puzzle me even more than I already had been. This now brought to a total of at least five different kinds of *Hymenocallis* to be found in the Durango-Sinaloa-Nayarit country and only seems to compound the problem of classifying them, rather than simplifying the matter. One wonders how many more species may be growing in adjacent country where there are no highways, waiting to be discovered?

The night in Mazatlan was pleasant and we had a delicious gourmet supper followed by much needed rest. Last year our trip southward through Sinaloa was dull because the country had not yet received any rains. This time the rains had been early and abundant and the country was cloaked in deep green with all kinds of roadside flowers in bloom. We found a *Hymenocallis* of the *horsmanii-repanda* group with linear glaucous leaves growing along mile after mile of roadside in low places. *Bessera* was growing in fair abundance in scattered colonies, but these were not yet in flower and we could not determine if they were the red kind or the violet forms. Not wishing to pass up any chances we collected them along with an unusually pretty dwarf *Oxalis* with large flowers in white or lavender. The three clover-like leaflets were unmarked and commonplace, but the flowers were larger than most and showier. We also found a plant that looked like a relative of *Bravoa*, but it was not yet in flower so we could not tell. Flowering along the roadside in low places was a little bulb irid akin to *Tigridia* in all shades of blue, purple, and white. Unlike *Tigridia*, these irids had the three larger segments curled upward and inward, as were the three smaller segments, suggesting a crumpled, globular effect. These little irids seemingly grew by the millions in Sinaloa and into the state of Nayarit. To be sure, we made it a point to collect these in all the various colors as they were quite showy.

Approaching Tepic, Nayarit, I spotted my first *Bessera elegans* in full flower. I could not hide my excitement when I discovered that in addition to the usual scarlet form, there were some beautiful carmine red kinds tinged with purplish-blue. I knew of these but this was my first experience at seeing them in full flower. Though of a darker coloring, they were every bit as showy and attractive as the coral-red forms. As they grew together, it was apparent that the carmine-red form was only a variation of the commoner coral-red *Bessera elegans* of our gardens. We also found a large colony of the lovely white *Tigridia passiflora* in flower and dug these also. Experience has shown that nearly every *Tigridia* species is worthy of superlatives when describing their fantastic form and beauty, but this one should rate near the top. The ivory white flowers are heavily spotted with gold, orange, brown,

and purple. Larger than most of the miniature Tigridias, they can hold their own in any garden. We dug a sizeable number of these, but as luck would have it, the bulbs did not dry out enough and nearly all were lost by a fungus which grew on them and destroyed most of them. I was only able to salvage a few at journey's end. The same fate was awaited my collection of carmine *Bessera*.

After eating a late lunch in Tepic, we drove eastward toward Guadalajara, hoping to make it by dark. But our collecting fortunes were not over. A few miles east of Tepic we again found *Bessera* in profusion. The scarlet ones were obviously the dominant form, but scattered here and there were the lovely carmine forms in fair numbers, but best of all, I finally found my first of the violet forms. Perhaps the word "violet" is too pat. Actually they might be called violet-pink, and violet-blue. Some were obviously more pink or rose than anything else, with just a touch of violet or blue. Others were deeper rosy-purple strongly tipped with prussian blue as seen in *Lycoris sprengeri*, and some *L. squamigera*. Except for this peculiar coloring, they were similar in form to the other *Bessera*. For awhile it looked as if they were too rare for us to find any quantity, but suddenly we spotted a little colony on a small hill along the road in which the lavender-pink forms predominated, with only a few scatterings of the carmine and scarlet forms. At long last we could dig them in quantity. It is my belief that these *Bessera* will prove a welcome addition to this little group and should become as popular as the coral-red forms.

Towards evening we made our last collection for this, our second day, a beautiful terrestrial orchid of the genus *Stenorynchus*. The tall hyacinth-like spike is of a lovely shade of soft rose-pink with salmon overtones. The flower stem usually precedes the foliage, which soon follows in a rosette of broad ground-hugging habit. As the thick roots are of tuberous habit, they can be handled like bulb plants, though the brittle roots should be treated gently.

The hour grew late and it was quickly darkening. We decided not to drive on to Guadalajara but instead stay in the little town of Ixtlan del Rio, in Eastern Nayarit. This proved to be a good idea, as we found a brand new little hotel, clean and modern in every way, and very inexpensive. The beds and mattresses were new, the plumbing was new, and they had hot water! What more could one wish for? Since we always make these trips with the idea that we are plant collecting and not vacationing as leisurely tourists, we generally stay in second and third class hotels to pinch pennies. Sometimes they are surprisingly good, and sometimes they are pretty grim, with hard pillows, sagging beds, perpetually cold water, and faulty plumbing fixtures. Thankfully this little hotel gave us the best at the same low price. We were pleased. Alas, the town did not have any really decent restaurant to match the hotel, since this is not a tourist town, and we had to eat the familiar hot enchiladas stuffed with chicken and green chilis. Having little else to do, we strolled about the town to see if there was anything of interest. A small town, not catering to tourists, Ixtlan del Rio is very quiet, but

we did find a small Fair in a residential area close to town. The only thing that seemed of interest was the Ferris Wheel. They must have thought that we were a couple of crazy tourists when we got on the thing for a spin. At least the view from the top was good!

The next morning we were at it again, digging up Mexico's roadsides. Our first stop found us examining *Hymenocallis* in bloom. These were the same as we had seen all day long the previous day. Some pretty white *Anthericums*, and some bulb irids in leaf grew with them. But what caught my eye was an odd little member of the spiderwort family that reminded me of "Widow's Tear" native to Texas. Unlike the deep blue "Widow's Tears", these were of an odd shade of coppery-tan color, and all three segments were of equal size and color. It looked as if it might prove a weed, but I collected it anyway. A species of *Tradescantia* grew alongside their copper-tan "cousins", and these flowered from a hyacinth-like spike. They impressed me as being the showiest of the "spider-worts" that I had seen.

Near the Nayarit-Jalisco state line we once again stopped to collect a few bulbs of an *Oxalis* species with huge 3-parted leaves, faintly banded with reddish brown and lightly pubescent over the entire surface. This species is easily the showiest and largest of the Mexican *Oxalis* that I have seen. The bulbs were unusually deep seated, making the digging difficult. The predominate color was deep purplish-rose but a few tended toward dark purple shades and others approached red. Casually it resembled the familiar *Oxalis Bowiei* (a frequently cultivated cousin from Africa) in size, coloring, and general appearance.

We stopped a few miles more down the road, after entering the state of Jalisco to dig some fine specimens of *Bessera elegans* flowering in company of *Milla biflora*. In the brilliant morning sunshine these *Bessera* were vividly scarlet, almost approaching orange in appearance.

We lunched in Guadalajara, but decided not to tarry as we still had a long trip ahead of us if we hoped to reach the Pacific coastal town of Manzanillo, in the state of Colima, by dark. The highway from Guadalajara to Manzanillo had only recently been paved and it now offered an opportunity to explore new areas for plants.

A few miles out of Guadalajara we stopped to collect *Oxalis tetraphylla*, a pretty little miniature with vivid rose-red flowers and many leaflets. A pretty violet-blue *Nemastylis* was just beginning to open in the early afternoon sun, and it appeared to be a form of *N. tenuis*. Apparently this dainty little bulb irid is fairly widespread over much of central and northern Mexico. *Milla biflora* was common here too, and we dug some especially fine forms with very broad segments. There were *Bessera* scattered about too, and these were a dazzling red-orange, the brightest in these shades we had yet seen. We found a few of the odd *Tigridia meleagris* scattered here and there, with their strange pendant bell-shaped blooms in plum and gold resembling the Fritillarias of northern gardens. We did not dig many, as the bulbs were very deeply entrenched in the hard black earth. Here too grew

Calochortus, but these things though widely distributed, are never common.

Near San Cayetaro I spotted *Hymenocallis* flowering in open grassy fields in very low wet places. We had some difficulty digging them out of the muck, and the soil had a sulphur-stench to it. So water logged was the ground that in certain spots the earth shifted and trembled under our footsteps, giving the same sensation of standing upright and attempting to walk in a small boat. The *Hymenocallis* were of the evergreen tropical type, with long swordlike leaves and pretty but undistinguished flowers of typical *Hymenocallis* form. The species was a new one to me, and though nice enough, it was not unusual enough to get excited about. A little later I did find something to get excited about though, when I spotted a large colony of *Bravoa geminiflora* in full bloom on a mountain curve. This was a fine compact growing form with orange-coral tubular bloom hanging loosely in pairs along the slender stem. The rosettes of narrow dark green leaves were prettily spotted with reddish purple at their bases. This being the largest colony I had yet seen, I was able to dig a nice supply of this little known relative of the cultivated tuberose.

At kilometer 1021, in southern Jalisco, I found in leaf what appeared to be a *Milla* of some sort. As none showed any evidence of flowering, I assumed that perhaps it belonged to that group of various *Milla* species that flower in the fall. I was able to flower one of these later on in my garden in September, but found it to be disappointingly similar to *Milla biflora*. Indeed I could see no differences at all, other than that it flowered later and the foliage was stiffly more upright. Only further study will solve this riddle. In this same spot we found a dwarf *Anthericum* species with tiny reflexed white flowers, opening in late afternoon. There were a few scattered Sprekelias with narrow glaucous leaves, but not in bloom, along with a bizarre member of the *Tradescantia* group with two broadly oval leaves hugging the ground.

Late in the afternoon we spotted some brilliant purple flowers on a mountainside and stopped to investigate. These proved to be a species of terrestrial orchid, perhaps *Bletia*, with tall spikes of large showy blooms. What appeared to be either a new *Bravoa* species, or a distinct form of *B. geminiflora* grew here too. These were not yet in flower, but the buds were showing enough color to indicate that they would likely be some shade of red. The foliage was unusually wide and flat, unspotted, and of a shiny light green color. These have done well under cultivation and it is hoped that they can be flowered in 1966 for comparison with the usual form of *B. geminiflora*. What appeared to be *Tigridia meleagris* were also in the bud stage, but these were difficult to dig because of growing so deeply. Bravoas, on the other hand, never grow deeply, but are just under the soil surface, making their digging a simple matter. Indeed, Bravoas resent being planted even so much as two inches deep and will immediately attempt to form a new bulb above the original one, just beneath the surface of the soil. In cultivation I have found that they like a rich well drained soil and plenty of moisture

while growing. They seem to resent alkalinity, deep planting, and dryness.

The sun was beginning to set when we made our final stop in the mountains, to check out *Hymenocallis* in flower. These had broad glaucous foliage and were very close to *H. choretis* and its allies. The flowers were large, but had a rather small staminal cup. I dug these along with some species of *Manfreda* and *Tigridia*, neither of which were in flower, though a few *Bessera* were. We had no road markers to tell us our location, but we knew we were still in the mountains of southern Jalisco, perhaps an hour or so from the coast. By the time we reached the little coastal village of Barro de Navidad, we were tired, so we decided to stay there for the night rather than drive on to Manzanillo which was still about 40 miles down the coastal highway. We had never heard of this little town, but it was a beautiful out-of-the-way place that adventurous tourists dream of—a place to get away from other tourists. We gorged ourselves on local lobster before retiring to our hotel. Perhaps it was the lobster, perhaps it was something else, but Chris awoke in the middle of the night with nausea and abdominal cramps. Those lobsters did not stay down long and old chief Moctezuma had once more taken this revenge on another gringo tourist! I had plenty of various pills for the occasion but in order for them to work, one must be able to retain them long enough in one's stomach, in order for them to be absorbed and go to work. Chris's stomach and old Moctezuma were not about to allow this to happen. I spent the rest of the night listening to Chris's pathetic groans, desperately trying to get some sleep. I don't know how many times Chris had to get up during that night. I was glad to see the sun come up and left Chris, more dead than alive in restless sleep, in order to take a brisk morning walk to get waked up. I walked along the beach and it was beautiful—certainly every bit as pretty as Acapulco. I returned to the hotel room and with great effort managed to get Chris to his feet and into the car. I then began the long work of trying to salvage this hulk that remained of the "Spanish quick step" with the drugs at hand. First some tablets to control nausea, then a crossing of the fingers. They threatened to return but did not. Good! Then some antibiotics, followed by paregoric. Everything stayed down. Good! From then on it was a combination of paregoric, Kao-pectate, and antibiotics for the greater part of the day. Chris was feverish, and did not know what went on most of that day, sleeping the hours away. Old Moctezuma made a stab at me too, but like always, I had a relatively light discomfort, with an annoying belly ache which I managed to keep soothed with paregoric. I suppose some people develop immunities to these things in time.

I stopped at Manzanillo to eat breakfast, leaving Chris in the car asleep. Then I drove on to Colima on highway 110. This would complete the "loop" from Guadalajara to the coast and back. While driving in the mountains once again, a flash of yellow caught my eye and I stopped to investigate. It proved to be one of the real "finds"

of the trip, a large flowered lemon-yellow irid allied to *Tigridia*. I have yet to get any kind of identification, but it seems to me to be a species of *Sphenostigma*, as the form is similar to the little white flowered *S. conzatti* that I found in the mountains of Oaxaca the year before. This yellow irid is unusually showy, as the color is one of those shades of yellow that fairly glows and the large flowers are nearly four inches broad! There are three long spreading segments and three smaller inner segments, all opening out flat, without any suggestion of a "cup" or hint of spotting. The foliage is in the tradition of *Tigridia pavonia*, being wide and pleated.

While digging these pretty yellow Irids I chanced to notice what appeared to be a robust sort of *Zephyranthes*. I dug a few bulbs and noted that several were ripening seed. Bulbs were typically of *Zephyranthes* size, and the seed pods were atop rather long pedicels. It suddenly dawned on me that these were not *Zephyranthes* at all, but a miniature *Sprekelia*. I had dug a few similar ones the evening before while collecting the fall blooming *Milla* species. As these too had glaucous leaves, I wondered if they might not be the same as the tiny *Sprekelia* species that I had collected in the mountains of Southern Puebla several years ago. Only time and more study will tell.

Just before reaching the city of Colima, I noticed a field of *Zephyranthes* in bloom and stopped. These turned out to be the only *Zephyranthes* that I found in bloom the entire trip and were familiar ones at that. I have collected this same species in Nayarit and Jalisco in other years. The majority of these were pink or white, but a few were deep rose-pink, almost rose-red in some individuals. There was a good deal of variation in form and size and I leisurely picked among them for the better forms. A little *Hymenocallis* growing with them caught my eye. One of the few true miniatures of the genus, I was impressed with the very narrow compact foliage of dark shiny green that lay close to the ground. A few were in flower or fruit and all scapes were either 1-2 flowered. The little bulbs were slightly more than an inch in diameter. Among the Mexican *Hymenocallis*, that I have seen, only *H. graminifolia* is as small, but it has prettier flowers than this Colima midget.

A little species of *Milla* grew here too in wet places and foliage was chive-like. None were showing any signs of flowering, so I assumed it must be another of the late blooming sorts. Judging from the density of the clumps and thickness of the colonies I judged it must seed freely and grow rampantly where conditions were wet enough for it. The corms were small as Millas go, and the chive-like leaves were glossy green and slightly flattened on one side. This is one species that will be closely watched until it flowers to find out just what it may be. It is such a weedly looking little thing that I can't see how a mousey plant can turn out to be very much! Maybe it is because it brought back old memories of collecting *Allium canadense* in Texas years ago. What a weed pest *that* one turned out to be! Never-the-less, I dug a goodly number of these *Milla* and crossed my fingers.

At mid-afternoon I spotted some purple *Tigridia* in flower along the roadside and stopped. Chris was still "out" cold. Indeed he even

slept through a rough hail storm that I had driven through in the mountains an hour earlier! I dug these Tigridias and a few plants that looked as if they might be akin to *Bravoa*, but these were not in bloom. The Tigridias were quite pretty, with large violet segments banded with yellow at the point where the "cup" is formed. The three inner segments were darker purple and the cup was spotted purple. This plant was quite similar to another *Tigridia* found in Michoacan, but the lighter coloring, yellow banding, and overall refinement made it seem more appealing.

My final collection for that afternoon was made east of Jiquilpan, in a pine tree forest where grew another *Tigridia*. This one was in leaf only, but it was the only species of the group that I found growing in such heavy shade. About this time Chris woke up and it was obvious that he suddenly felt much better. He had been sleeping the entire day and was now obviously rested. Except for his nearly lifeless body reminding me of his presence, I might just as well have been traveling alone that day. It was nice to see that his illness had run its course and have him back among the living. This is not my first experience at having a traveling companion succumb to the Aztec curse in Mexico, so I am pretty well familiar with all its miseries. It is one of those things that every tenderfoot may as well expect and it is next to impossible to avoid. Generally an attack or two makes one immune. The main thing is to assure the victims that they will not die, even though they may wish to. It is one of those things that travelers joke about but it is not funny to the poor victim.

We spent a pleasant evening at Chapala, a lovely tourist resort on the banks of Lake Chapala. We were both famished and ate supper twice. We departed the following morning, passing through Guadalajara without stopping, as we anticipated a pretty busy day ahead of us. A few miles north of Tepatitlan I stopped to investigate a large field of a pretty yellow flowered tuberous rooted *Sisyrinchium*. These little irids are found over much of Mexico, but this was the largest colony I had yet seen. I dug a few of these and then noted a splash of purple nearby. A check showed it to be a colony of *Nemastylis* that was not familiar to me. These were of a rich purple color and of a nice form and size and growing from unusually small bulbs, being little larger than peas. Though close to *N. tenuis*, this little jewel was, if anything, even prettier, being more brightly colored and flowering early in the morning. *N. tenuis* does not open until warmed by the afternoon sun. After digging enough bulbs, I stopped to take color photographs of this remarkable island of *Nemastylis* within a sea of *Sisyrinchium*. It was a sight to behold, but a short lived one as the Sisyrinchiums were beginning to close. By the time we got back into the car all Sisyrinchiums had closed and they had seemingly vanished into the grassy landscape!

We did not collect any more bulbs that morning as we did not see anything that we did not already have. I was surprised to find a few *Bessera elegans* flowering along the roadside in chalky soil near San

Juan de los Lagos. I did not expect these things so far north in this part of the central Mexican plateau country. We ate lunch in Lagos de Moreno and then turned southward once again towards Leon, Guanajuato, where Mr. and Mrs. Clint had once told me of finding a pinkish-white *Bravoa* species among other things. As it turned out we did not have to travel that far to find them as they grew in fair numbers just outside of Lagos de Moreno. This was one of the plants that I had placed on my "must find" list when I planned this trip. At first glance it closely resembles the tuberose of our gardens *(Polianthes tuberosa)* and is obviously related to it. The flowers of these may be creamy-white, or white flushed with pink, or even light pink in some cases. Though quite fragrant, its scent is very different from *Polianthes tuberosa*, and the flowers are smaller. A thoroughly delightful plant, this little *Bravoa* (or *Polianthes?)* species deserves to be cultivated. We passed a man walking along the roadside with a knapsack over his shoulder in what must have been an armload of these *Bravoas* picked to be sold in the markets for cut flowers. It made me realize that this species may become rare indeed before long. All of Mexico is now being criss-crossed with the familiar barbed wire fences. Since livestock will no longer be allowed to roam and graze at will, overgrazing within fenced in lands will be inevitable and many rare plants will disappear. This leaves them clinging to the roadside right of way where they will make their last stand. The constant raids on the remaining Bravoas for cut flowers will allow few to ripen seed. The result of all this is easy to predict. Their problem is that they are being loved to death. Cattle love them and the natives love them, and this kind of loving is not good for the future of this species!

While digging these Bravoas I noted the many other bulbous odds and ends that the Clints had mentioned. We dug merrily like a pair of gophers. There was an unusually pretty *Anthericum* with low foliage and large showy glistening white blooms. Certainly this was as fine as any *Anthericum* I had ever seen. There were bright rose-red *Oxalis tetraphylla* that fairly glowed like rubies, so brilliant were they. Another *Oxalis* species grew there too, but this one had lavender blooms and slightly different foliage, though both species had those many extra leaflets that distinguished them from kinds with clover-like leaves. There were *Nemastylis* there too, likely *N. tenuis*, though we did not see flowers. A pretty yellow flowered *Cyclobothra (Calochortus)* grew with these other things. I had a field day and collected a bit of everything in sight.

It was a long trip down to Morelia, Michoacan, but we saw little else of botanical interest to delay us and we arrived at dusk. We spent the night in Morelia and left the following morning after breakfast. A few miles east of the city we stopped to climb a mountain that we had climbed the year before. On this mountain grew *Bravoa geminiflora*, *Zephyranthes*, *Milla biflora*, *Sprekelia*, a small white flowered *Oxalis*, and a dainty little tuberous rooted *Tradescantia*. For reasons hard to explain, we decided to climb to the top of this mountain. This we did and the view was magnificent! We also had the satisfaction of ac-

complishment which I guess is the motivation of mountain climbers. We rested long enough to admire a hawk of the genus *Buteo* soaring in leisurely circles below us and noted that only at an elevation such as this mountain top might one look down at flying birds.

Back on the road again, we drove through the rugged Michoacan mountains known as "Mil Cumbres" and it was a relief later to find some straight stretches of plateau country. At kilometer 221 we stopped to collect a purple *Tigridia* that grew in great abundance in mucky soil. Later in the afternoon, at kilometer 185, near Zitacuaro we stopped to collect from a thick colony of *Tigridia meleagris*. This species, with its pendent bells, has proved to be one of the easier ones under cultivation. Though not showy, the flowers are none-the-less very beautiful when seen at close range. Flower color is quite variable, but one form is yellow heavily spotted with plum purple on the exterior. The interior is white, spotted with purple and banded with ivory "glands" that reflect light like tiny sequins. It is one of those flowers that one is tempted to tear apart in order to fully appreciate. Growing with this *Tigridia* was that same mousey little *Milla* that weedily grows in ditches and other damp low spots that I first collected in Colima. These were not in flower either.

We arrived at Toluca, in the state of Mexico, at mid-afternoon and from there turned southward on highway 55 toward the state of Guererro, and Taxco, where we would spend the night. Nearing Taxco in the early evening, we stopped to collect *Milla magnifica* growing in great abundance in a rocky outeropping. This relatively new species has proved to be very amenable to cultivation and should become popular in time. I was anxious to get a hundred or so corms in order to build up a supply for introduction of this fine species. A flowering sized corm usually produces three hollow leaves resembling those of an onion, but often growing three to four feet in length. The scape may have 20-30 fragrant white flowers striped with green on the reverse. These seem to belong to a group of Millas which flower at their best after dark. We dug a few *Sprekelia* bulbs which grew alongside the Millas.

We spent the night in Taxco, and after doing a bit of shopping the following morning, we hit the road again towards Iguala and what would be the end of our field trip before turning homeward. A few miles south of Taxco we stopped to collect a few *Nemastylis* in leaf. I had collected some pretty white-flowered *Nemastylis* in this area the year before and I hoped that perhaps these too would turn out to be white ones. Most *Nemastylis* run to shades of blue, violet, or purple, so white ones make a welcome change. There is a beautiful yellow species that grows around Chilpancingo, also in the state of Guererro, but we did not go that far on this trip. I have a few of these yellow ones in cultivation and, like all *Nemastylis*, they seem to do very well under cutivation.

We drove south of Iguala about 30 miles to the southernmost point of our trip, where we hoped to recollect an unusual member of the *Milla* clan which we had found in flower the year before. There is a

good possibility that this odd plant may turn out to be the long-lost *Diphalangium graminifolium*. The little white flowers grow in an *Allium*-like umbel and the segments recurve in the manner of *Cyclamen*. They seem to do well in cultivation, but they skipped blooming the first season after being collected. Indeed I find that nearly all members of the *Millinae* group will not flower the year following their collection while in active growth, but after that they bloom regularly. We found our plants easily enough and then turned homeward. With but a few exceptions, we now had nearly all the plants that we sought.

By late afternoon we were in Cuernavaca, and we made a brief detour towards Yautepec and Cuautla to recollect a tiny little *Milla* species that is closely allied to *M. biflora*. This one is undoubtedly a new species, and has characteristics that easily differentiate it from *M. biflora*, such as flowers with distinct pedicles, and numerous thread like leaves.

We stopped in Mexico City long enough to eat supper before driving on to Zimapan, on the Pan American highway, where we spent the night. The next morning we paused at Jacala to collect *Allium glandulosum*, a pretty wine colored stoloniferous species that flowers in the fall. We also dug a white-flowered *Zephyranthes* that grows just south of the city and these turned out to be our final excavations for that trip in Mexico. We then drove on to Laredo where our bulbs went through the usual inspection and fumigation ceremonies. Arriving home in San Antonio, I had the back breaking job of getting these plants back into the ground so that some of them could complete their growing cycle. Some of these resumed growing and a few things even flowered. Many will not flower until next year, while others will fail to appear at all. Nearly all survivors will be fully mature and should flower well in 1967. To be sure, not all collected plants survive the shock of being dug before they complete their growth cycle. Some will succumb to fumigation and others will fall prey to disease and soil parasites. Some may find our soil and/or our climate not to their liking and will gradually waste away. But the majority will adjust to cultivation and prove themselves worthy of all the effort spent in securing and pampering them. This then will be reward enough.

NECTARIES IN ALSTROEMERIA PULCHELLA

Hamilton P. Traub

Dichogamy in *Alstroemeria pulchra, A. haemantha,* and *A. pulchella* was reported by Traub in Herbertia 10:131—132. fig. 103. 1943. At that time no attempt was made to consider also the role of insects and/or humming birds in any mechanisms for cross-pollination.

The late E. O. Orpet had earlier crossed *Alstroemeria violacea* and *A. pelegrina alba*, and had obtained a fine hybrid which was named in honor of his wife, *Alstroemeria* x *orpetiae*. This is an outstanding purple-flowering hybrid, with large, wide-open flowers and is an excellent garden subject. In the second generation, some very beautiful white-flowering segregates appear in the Mendelian ratio of about 3 purple to 1 white, if a large number of seedlings are grown.

In the course of attempts in 1965 to cross *Alstroemeria pulchella* ♀ with *A.* x *orpetiae* ♂, the presence of nectaries was noted in the first named species but not in the latter.

As soon as the flowers of *Alstroemeria pulchella* open, the presence of copious nectar is noted. In each flower, the two upper petsegs (4.5 cm. long) only are in part functional as nectaries. The basal portions of the two petsegs are flattened, with sides in each one infolded and fused into a nectary with an opening at 1.7 cm. from the base. At this opening a relatively copious globule of clear sweet-tasting nectar is exuded. *A. pulchella* is a typical Brasilian species and it apparently depends on humming birds and possibly also insects for transferring pollen from one flower to another. *A. violacea* and *A. pelegrina alba*, are Chilean species and the pollinating agents are at present unknown.

THE BLACK SURINAM-CHERRY, EUGENIA UNIFLORA

Hamilton P. Traub

The usual red-fruited form of the Surinam-Cherry, *Eugenia uniflora* L., has long been grown in Florida as an ornamental shrub. However, the fruit as remembered by the present writer was not of high quality and was not relished due to a peculiar taste. Since the Second World War, a "black"-fruited form has become popular in Florida. Several years ago the writer obtained seeds of this form from Florida, and it appears to be adapted to the coastal area of San Diego County, at least it has thrived in his garden in La Jolla, where it has made a fine medium-sized hedge to replace the usual too-vigorous *Eugenia paniculata* Banks, the Australian Bush-Cherry with undesirable fruits, which soon gets out of hand, and assumes the size of forest trees. Even the smaller-sized form is not satisfactory as a hedge.

The fruit of the Surinam-Cherry is red to very deep-red black in color, and the dessert quality, especially of the black form is delicious *when fully ripe*. This stage of ripeness can be determined when the fruits separate from the pedicels easily, leaving the pedicels on the shrub.

The Surinam-Cherry can be easily propagated from seeds and comes into bearing in two to three years. It would be desirable to select superior clones to be propagated vegetatively, but so far the rooting of cuttings has not met with success. However, this difficulty most likely can be overcome on further study.

PLANT LIFE LIBRARY

ESSAYS ON CROP PLANT EVOLUTION, edited by Sir Joseph Hutchinson. Cambridge University Press, London. 1965. pp. 204. $9.50. Since the time of Alphonse DeCandolle's classical work, "Origin of cultivated plants", published in 1882, there have been few comprehensive studies of this important group of plants. DeCandolle's work on the origin of cultivated plants was followed by a long period of dormancy until it was revived and stimulated by the studies and explorations of Vavilov and his Russian colleagues shortly after World War I. During the past twenty years a flood of information about the origin and domestication of crop plants has accumulated. Unfortunately, much of this work is scattered through the literature, and is available only to specialists.

It seems doubtful that all that is known about the evolution of crop plants could be recorded in a single volume of reasonable length. Accordingly, "Essays on crop plant evolution" does not attempt to cover the entire field of domesticated crop plants; instead, a few of man's most important and diverse crop plants are selected for discussion by competent experts. The book is edited by Sir Joseph Hutchinson, and is based upon a series of lectures delivered at Cambridge University in 1962. The initial essay by Prof. H. Godwin, "The beginnings of agriculture in North West Europe", lays the groundwork for much of what follows. Sir Joseph makes a most successful attempt to give unity to the effort with a terminal essay, "Crop plant evolution: A general discussion." Sandwiched between these contributions are essays on maize (Mangelsdorf), sorghums (Doggett), temperate zone cereals (Bell), wheat (Riley), potatoes (Dodds), and forage grasses and legumes (Cooper).

In point of time, the crops treated are as diverse as wheat, domesticated about 7000 B. C., contrasted with some of the grass and forage legumes that are just now commencing to become cultivated plants (Cooper). The coverage is not so satisfactory. It is regretable that the book was not expanded to include an account of cotton to which Sir Joseph has made substantial contributions. Also, it is curious why rice was omitted from the discussion. Here is a crop plant which provides nearly the entire caloric intake of millions of people in the less developed countries, and its evolution has been thoroughly investigated. Given the limitations of space, however, it is doubtful if a list compiled by any two people would be identical.

Except for scope it is difficult to find fault with this well-written book. Each contributor has handled his material in comprehensive, but interesting fashion, and it would be unfair to comment favorably on one essay over the other. Nevertheless, this reviewer cannot refrain from commending the discussion of the "Evolution of Maize". Mangelsdorf has told the maize story in flawless fashion. Some new and critical data have been added from his own research along with several of Galinat's magnificent diagrams of maize morphology. Maize historians who choose to disagree with all or portions of Mangelsdorf ideas on the origin of this crop will have to come-up with some significant data to support theories other than those proposed in this essay.

Mangelsdorf presents a compelling argument to show that the tunicate gene (tu), with its system of modifiers and strong pleiotropic effects, was largely responsible for influencing the direction of maize evolution once maize became a cultivated plant. Thus indirectly all indigenous civilizations of the Americas were dependent upon a single locus of chromosome 4 for their development. In much the same way what is known as Western civilization was dependent for its development upon the diploidization of polyploid wheats. In a beautiful series of experiments Riley and his co-workers have shown that a mutation at the pairing locus of chromosome V has "imposed a diploid-like meiotic regime" upon tetraploid and hexoploid wheats. As a result, the polyploid wheats have a stable genotype, are highly fertile and immensely productive, essential requirements for a successful, cultivated seed crop.

The book has an adequate bibliography, a good index, and is relatively free of irritating typographical errors.—*Thomas W. Whitaker*

AGRICULTURAL GENETICS, by James L. Brewbaker. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1964. pp. 156. $4.95. The audience for which this small book of 156 pages is intended is not immediately apparent. Neither the remarks of the editors or the author's Preface are helpful in suggesting an appropriate niche for the book. Judging from its content the book could be used as an adjunct to a course in plant or animal breeding, or possibly as supplementary reading for graduate students in the agricultural sciences. To be read with understanding, however, some background in genetics and cytology, along with an elementary knowledge of statistics will surely be needed.

According to the Editors, the aim of the Foundation of Modern Genetics series is to provide a stimulating, selective account of certain areas of genetics. In compliance with this directive Brewbaker has discussed a number of aspects of genetics important in agriculture such as polygenic inheritance, genotype-environment reactions, host-parasite relationships, polyploidy, genetic lethals, breeding systems, mutation, and others. Obviously, with a great number of topics to be treated in limited space, not all could be explored in depth. Furthermore, a broad treatment of each topic would have forced the author to infringe upon the territory of his colleagues who have prepared books in this series on Gene Action, Population Genetics and Evolution, and other subjects germane to agricultural genetics.

Like most successful texts in genetics a list of problems (usually 4 or 5) terminates each chapter. Evidently for the purpose of conserving space, references are to general works rather than to original papers. This can be a source of annoyance and frustration for the inquisitive student and investigator.

To the uninitiated some of the examples used to illustrate certain phenomena are likely to be more confusing than enlightening. For instance, in discussing Stakman's classical work with physiological races of wheat rust, the data cited are for races of wheat *bunt* rather than races of *rust*. No explanation is offered for the sudden switch between rust and bunt.

The book is never dull, and is not overburdened with technical jargon. Brewbaker writes clearly and concisely, and he is adept at coining sharply worded phrases. There are several noticable grammatical lapses and a few typographical errors. These could have been eliminated with better editing. There is an index of 4 pages: one error was detected in a sample of 10 items. The faults are mostly of a minor nature and in the opinion of this reviewer the book will achieve its objective of stimulating the thoughtful reader to take a close look at the fasicinating genetic problems of modern agriculture.—*Thomas W. Whitaker.*

PLANT HYBRIDIZATION BEFORE MENDEL, by H. F. Roberts. Hafner Publishing Company, New York and London. 1965. 374 pp. $6.75. The Hafner Publishing Company deserves the thanks of plant breeders, plant geneticists, and indeed all biologists for reprinting "Plant Hybridization Before Mendel". Originally published in 1929, the first edition has long been out of print. In the intervening years Roberts' book has become a classic for the period it covers. Plant breeders and plant geneticists with an interest in the historical development of their discipline will welcome an opportunity to consult this standard reference on hybridization prior to 1900. Except for some of the illustrations the book is neatly reproduced, fully the equivalent of the original.

Roberts lets the early hybridizers tell their own story. This system, using long quotations interspersed with narrative, can be both good and bad depending upon the skill of the investigator in describing his observations and experiments. At times it is intensely interesting, but on the whole it tends to be dull reading. This comment, however, is not intended to reflect upon the usefulness of the book as a reference source.—*Thomas W. Whitaker.*

KURZE GESCHICHTE DER GENETIK BIS ZUR WIEDERENTDECKUNG DER VERERBUNGSREGELN GREGOR MENDELS. 2 Auflage. [A short history of genetics up to the rediscovery of Gregor Mendel's laws. Second Edition.] by Hans Stubbe, Gatersleben. Veb Gustav Fischer, Verlag, Jena. 1965. Illus. The first edition of this book published in 1963 was reviewed in Plant Life Vol. 20 (1964).

The new edition published in 1965 is essentially identical with the first edition, except the second edition has been increased by 40 pages over the earler edition.

The new material consists mostly of a facsimile reproduction of Mendel's famous letter to Carl von Nägeli, and the addition of the portraits of 5 distinguished investigators, the best known being William Bateson. It would have been helpful if a German printing of Mendel's letter had accompanied the facsimile reproduction. Only an expert could decipher the combination of German script and Mendel's handwriting.

Portions of some chapters have been rewritten to include new material but the original text remains largely unaltered. This book is one of the best accounts of the history of genetics up to 1900. Its usefulness and popularity would undoubtedly expand if a good English translation were available.—*Thomas W. Whitaker.*

FERTILIZATION, by C. R. Austin. Prentice-Hall, Englewood Cliffs, N. J. 07632. 1965. Pp. 145. Illus. Cloth bound. $4.95; paperback, $2.95. This stimulating new text dealing with general knowledge about fertilization in organisms is intended primarily for students and research workers. Chapter 1 is concerned with general cytology as a basic cellular background for the rest of the discussions. The other chapter headings are: significance of fertilization; form and differentiation of gametes; approximation of gametes; contact and fusion of gametes; immediate consequences of fertilization; and unusual and abnormal forms of fertilization. This excellent text is highly recommended.

PLANT PATENTS, WITH COMMON NAMES, 1964 SUPPLEMENT, 2337 THROUGH 2464. Publ. by the Amer. Assoc. of Nurserymen, 835 Southern Bldg. Washington, D. C. 20005. Pp. 7. $0.50. This is a supplement to the listings of plant patents previously published. The subject matter is arranged under three parts: I. Numerical listings; II. Alphabetical listing under common names; and III. Alphabetical listings of names and addresses of originators or discoverers and assignees.

THE JOYS OF GERANIUMS, by Helen Van Pelt Wilson. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1965. Pp. 304. Illus. $6.95. This is a revised and enlarged edition of the well-known book on geraniums (pelargoniums) with which the readers are already familiar. It is a guide to the species and named clones, propagation by cuttings, breeding and culture, including the control of pests and diseases. Recommended to all interested in geraniums.

IT'S YOUR COMMUNITY, by H. B. Raymore and H. S. Ortloff. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1965. Pp. 240. $3.95. Subtitled, "A Guide to Civic Development and Beautification", the objective of this new book is to provide a background for the "maintenance of beauty and fitness in our surroundings." Among the topics covered are "call for action", urban patterns, the modern American community, traffic and parking, open spaces, street trees, roadside beautification, local planning and zoning, urban renewal, organization of projects, etc. Recommended to all interested in civic improvement.

THE FLOWER ARRANGEMENT CALENDAR, 1966, by Helen Van Pelt Wilson. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1965. Paper with plastic ring binding. Illus. $1.50. The publisher sponsors an annual flower arrangement calendar contest. In this little book, the 20th edition, some of the outstanding photographs of floral arrangements accepted by the publisher are reproduced in calendar form for 1966. This calendar will interest those engaged in flower arranging.

NATIVE WILD PLANTS OF NORTHEASTERN UNITED STATES AND EASTERN CANADA, by F. H. Montgomery. Frederick Warne & Co., 101 5th Av., New York, N. Y. 10003. 1965. Pp. 193. Illus. $3.95. This book is designed for those who desire an intermediate guide that provides more than casual acquaintance with the native flora. The book is profusely illustrated with line drawings and some color plates. Following the key, the wild flowers, under common and scientific

names, commonly found in the areas indicated in the title, are very briefly described. Recommended to all interested in native American plants.

WEEDS OF THE NORTHERN UNITED STATES AND CANADA, by F. H. Montgomery. Frederick Warne & Co., 101 5th Av., New York, N. Y. 10003. 1965. Pp. 226. Illus. $3.95. The purpose of this book is to provide an aid to the identification of particular weeds of the areas indicated in the title rapidly. The key is followed by the description of 365 weeds under common and scientific names. Highly recommended.

CREATIVE DECORATIONS WITH DRIED FLOWERS, by Dorothea S. Thompson. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1965. Pp. 125. Illus. $6.95. In this book the silica-gel method of drying flowers is explained, and its application in creating designs is discussed. Highly recommended to all who are interested in flower arranging.

FLOWER ARRANGEMENT WITH ANTIQUES, by Beth Hemingway. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1965. Pp. 191. Illus. $5.95. The purpose of this beautifully illustrated book is to "give both the flower arranger and the collector a simple and lucid account of the ways by which one art can enrich the other." The topics included are basic arrangements; arrangements for the living room, library, dining room, and other places and occasions. Highly recommended.

THE NEW BOOK OF FOLIAGE ARRANGEMENTS, by Emma H. Cyphers. Hearthside Press, 381 Park Av., S., New York, N. Y. 10016. 1965. Pp. 152. Illus. $4.95. This revised and enlarged edition of a standard text on foliage arrangements by an authority brings the subject up-to-date. It is recommended to all who are interested in flower arranging.

THE ROSE QUESTION AND ANSWER BOOK, by John Milton. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1965. Pp. 192. $3.95. This book, by an authority on roses, is concerned with the problems commonly met with by the rose gardeners. It is arranged on the questions and answers plan. The subject matter includes kinds, culture, insect and disease control, roses in garden design, hybridization, etc. Recommended to all interested in rose growing.

HOME AND GARDEN CALENDAR, 1966. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. Paper with plastic rings. Illus. $1.50. The Federated Garden Clubs of New York State sponsor an annual flower arrangements calendar contest. In this little book, some of the outstanding photographs of floral arrangements accepted are reproduced in calendar form for 1966. The calendar will interest those engaged in flower arranging.

THE AFRICAN VIOLET CALENDAR, 1966. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1965. Paper with plastic rings. Illus. $1.50. The publishers sponsor an annual African Violet Arrangements Calendar contest, including also Gloxinias and other gesneriads. In this little book, some of the outstanding photographs of arrangements accepted are reproduced in Calendar form for 1966. This calendar will interest those engaged in flower arranging.

FERNS OF THE SOUTHEASTERN STATES, by John Kunkel Small. Reprint of the 1938 text. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1964. Pp. 517. Illus. $10.00. Those interested in ferns will be grateful for this fine reprint of Small's 1938 text which has long been out of print. This includes a brief appreciation by Dr. Hume of Dr. Small who died in 1938. After an introduction giving the author's outlook on the grouping of the ferns and fern allies, and plant provinces of the Southeastern United States, there follows a key to the orders, families and genera for students; the description of 189 ferns and fern allies; the general and restricted distribution of the species; taxonomic lists, with citations; list of authorities cited; a glossary, and an index. This book is indispensable to those interested in the ferns and fern allies.

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THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

I. THE AMERICAN AMARYLLIS SOCIETY

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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PLANT LIFE

AMARYLLIS
YEAR BOOK

1967

Amaryllis argilagae

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BAU UND FEINBAU DER PFLANENZELLE, by Von Dr. Peter Sitte. Veb Gustav Fischer Verlag, Jena. 1965. pp. 231 28-MDN. Peter Sitte, Professor für Zellenlehre und Biologische Elektronenmikroskopie, Universität Heidelberg, has authored a thorough and detailed study of the gross and fine structure of the plant cell. Thoroughness and mastery of detail is typical of German scholarship in biology. The book under review is an excellent example of this traditional technique.

There are single chapters on Cytological Methods; Molecular Morphology of the Cell; the Nucleus; Cytoplasm and Cell Organelles; Plasma Membranes and Vacuoles; Cell Wall; and a final chapter on the Organization of the Cell. It is a relatively small book, but packed with information served-up in usable form. There are 450 references to original works collected in the rear of the book, along with independent Author and Subject indices. In a separate section there are also from 1 to 8 general references to each sub-chapter topic. This convenient and practical feature will allow investigators to easily increase their information about specific subjects. The illustrations are of high quality except the photographs of mitosis and meiosis. These photomicrographs are either poorly reproduced or the originals were not as sharp as they should have been for good reproduction. An excellent reference book with much original research.—*Thomas W. Whitaker*

A HISTORY OF GENETICS, by A. H. Sturtevant. Harper & Row, New York. 1965, pp. 165, $5.50. Biologists in general and geneticists in particular will welcome this lively history of genetics by one who has lived through and contributed much to the exciting discoveries of this still young discipline. Professor A. H. Sturtevant tells the story of genetics from pre-Mendelian times to about 1950. The work on the structure and coding of NDA and RNA are purposely omitted as being beyond the scope of the book. Likewise, newer developments in several other important fields such as population genetics, ciliate genetics, etc., are passed over. As Prof. Sturtevant suggests, these subjects have been adequately, and in some cases repeatedly covered by current reviews and special symposia.

Prof. Sturtevant's contribution may not be history as historians understand it, but it is certainly the resource upon which future historians will have to depend for source material. Dr. Sturtevant was either a contributor to, or had first-hand knowledge of, many of the landmarks of classical genetics. As such he writes entertainingly, with authority, and unusual insight.

The book is graced with two exceptional features: Appendix A, Chronology, and Appendix B, Intellectual Pedigrees. The Chronology arranges the great discoveries that are the core of genetics into a time sequence along with the name or names of those responsible for the particular advance. The Intellectual Pedigrees are skillfully done. They demonstrate impressively that a few great teachers along with their students have led the advancing frontiers of genetics for almost half a century.

This delightful book of 165 pages is terminated with an 11 page bibliography and a satisfactory Index.—*Thomas W. Whitaker*

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PLANT LIFE, VOL. 23, NO. 1, January, 1967

AMARYLLIS
YEAR BOOK
1967

Year Book of
The American Amaryllis Society
34th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
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Mr. R. G. Hoog, **Ky.**
Mr. Guy L. Wilson, **Northern Ireland**
*Mr. R. W. Wheeler, **Fla.**
Dr. B. A. Dyer, **South Africa**
Chas. C. O. Fairbairn, **Australia**
Mrs. Mary G. Dewey, **Penna.**
Mr. Mulford B. Foster, **Fla.**
Dr. J. C. Th. Uphof, **Fla.**
*Mr. E. A. Bowles, **Eng.**
Mr. Thomas R. Manley, **Penna.**
Dr. Robt. F. Hoover, **Calif.**
*Mr. E. O. Orpet, **Calif.**
Mrs. Morris W. Clint, **Texas**
Mr. Wyndham Hayward, **Fla.**
Dr. Robt. G. Thornburgh, **Calif.**
*Prof. Ira S. Nelson, **La.**
Mr. Frederick B. Jones, **Texas**
Dr. Floyd F. Smith, **Maryland**
Mr. W. D. Morton, Jr., **La.**
Mr. S. Y. Caldwell, **Tenn.**
Mr. Robt. D. Goodert, **Fla.**
Mr. Leon Boshoff-Mostert, **S. Afr.**
Dr. Martin Cardenas Hermosa, **Bolivia**

*Deceased.

(b) CORRESPONDING FELLOWS

Antilles—Dr. H. F. Winters, **Mayaguez, Puerto Rico**
Brasil—Dr. Alberto Castellanos, **Rio de Janeiro**
Australia—Mr. Wm. Morris, **Cairns, Queensland**
Finland—Mr. I. V. O. Pirhonen, **Helsinki**
England—Mr. Reg. F. Harradine, **Potters Bar**
India—Mr. Sydney Percy-Lancaster, **Lucknow**
South Africa—Mr. Leon Boshoff-Mostert, **Balfour**
Argentina—Prof. Pedro F. Ravenna, **Buenos Aires**

[THE AMERICAN AMARYLLIS SOCIETY—continued on page 155.]

PREFACE

The cover design, by Prof. Penrith B. Goff, of the University of Kentucky represents the new *Amaryllis argilagae* as grown by Dr. C. G. Ruppel in Argentina. We are all indebted to Prof. Goff for this beautiful cover.

This thirty-fourth edition of the AMARYLLIS YEAR BOOK is dedicated to Dr. Martin Cardenas, the noted phytologist and plant explorer of Bolivia, who received the 1967 HERBERT MEDAL in recognition of his outstanding contributions toward the advancement of the amaryllids. The Medal is presented to him with the congratulations of all the members. Over a number of years, Dr. Cardenas has discovered various new *Amaryllis* species, and other amaryllids. To the present edition, he contributes an autobiography, a note on the reduction of "Lepidopharynx Rusby" to *Amaryllis* L., and an article on the *Amaryllis* species of Bolivia.

Other articles on *Amaryllis* include breeding reports by V. Roger Fesmire, Joseph Mertzweiller and Clarence J. Crochet; reports on the introduction of new *Amaryllis* species by Claude W. Davis; experiences with the clone 'Senorita', by Keith Brown; accelerating blooming in *Amaryllis* with bottom heat by J. L. Doran; cultural notes by Burr Clouette and Mrs. Fred Tebben; and the annually eagerly awaited report on the *Amaryllis* season of the past year, by Robert D. Goedert.

There are various articles on other amaryllids. These include notes on *Paramongaia* by Dr. Seibert; *Nerine* notes by Emma D. Menninger, and *Nerine* breeding in England, by J. T. Gallagher; and notes on freedom of flowering in *Nerine sarniensis* by Prof. Ken Douglas.

Dr. Vargas contributes notes on *Eustephia* species; Prof. Ravenna reports on the status of *Nothoscordum felipponei* and its chromosomes; Dr. Flory and S. Bose discuss the chromosomes of *Sprekelia;* and Prof. Wilsenach reports on the chromosomes of *Tulbaghia.*

Fred B. Jones contributes an article on *Crinum strictum* in coastal Texas; L. S. Hannibal reports on *Crinum* clone 'June Harris' and the Milk-and-Wine Lily confusion; Mrs. Morris Clint on the culture of *Crinum luteolum* in Texas; and Dr. Zorbach on the culture of Crinums in Maryland.

Quinn Buck contributes a daylily report; L. S. Hannibal reports on *Hannonia hesperidium;* Burr Clouette writes about *Ungernia* culture; Prof. Claude W. Davis reports on *Lycoris* culture in the lower Gulf Coast region; and Dr. E. G. Corbett favors us with an article on the asexaul propagation of *Lycoris.*

A number of new amaryllid species are described,—*Amaryllis argilagae, Eucharis korsakoffii, Hymenocallis aztecciana, Allium howardii,* etc.

There are reports on the 1966 Amaryllis shows, In Memoriam notices on Ira S. Nelson, Frank Harrison, Mrs. Emma Louise Davis Hayward; and notes on early daylily hybridizers by Mrs. Nicolet. And there are various other articles and notes as shown by the table of contents.

Contributors to the 1968 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1967, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.

December 15, 1966,
5804 Camino de la Costa,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page vi.

WEDDING FLOWERS, DECORATIONS AND ETIQUETTE, by Virginia Clark, 2nd ed. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1966. Pp. 160. Illus. $6.95. This is a complete book on the planning and carrying through the wedding. The members of the Society will be particularly interested in the advice on flowers, foliage, designs, church and home decorations, and the making of corsages, boutonnieres and bouquets. Highly recommended.

THE PICTURE BOOK OF ANNUALS, by Arno and Irene Nehrling. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. Pp. 288. Illus. $6.95. This attractive new book on annuals by outstanding authorities on the subject will be welcomed by all gardeners. In part I, the annuals, arranged alphabetically (A-Z), are described in popular language, and are profusely illustrated. This part alone is worth the price of the book. In part II, the growing of annuals from seeds is detailed; and in part III, the use of annuals is considered. Highly recommended to all gardeners.

HOME AND GARDEN CALENDAR, 1967,. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. Paper with plastic ring binding. Desk ed. $1.50; purse ed. $1.00. Illus. The Federated Garden Clubs of New York sponsor an annual flower arrangements calendar contest. In this little book, some of the outstanding photographs of flower arrangements with text accepted are reproduced in calendar form for 1967. Recommended to all interested in flower arranging.

1967 ROSE CALENDAR. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. Paper with plastic ring binding. Illus. $1.50. In this little book, rose arrangements, and other rose subjects, with text, are arranged in calendar form. Recommended to all interested in roses, and flower arrangements in general.

THE FLOWER ARRANGEMENT CALENDAR, 1967, by Helen Van Pelt Wilson, 21st ed. Wm. Morrow & Co., 425 Park Av. New York, 16, N. Y. Paper with plastic ring binding. The publishers sponsor an annual flower arrangement calendar contest. In this little book, the 21st edition, some of the outstanding photographs of floral arrangements accepted by the publisher are reproduced, with text, in calendar form for 1967. This edition includes among others, four color plates. Recommended to all interested in flower arrangements.

THE GARDENER'S BOOK OF VERSE, edited by Helen Van Pelt Wilson. Wm. Morrow & Co., 425 Park Av. S., New York 16, N. Y. 1966. Pp. 128. Illus. $4.50. This is volume one, and contains poems for five seasons—winter, spring, summer, autumn, and Christmas. The poems are selected from the literature of the world—Coleridge, Cowper, Whittier, Frost, Hardy, Wordsworth, Songs of Solomon, Shakespeare, and many more. Recommended to all gardeners.

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Dedicated to
Martin Cardenas Hermosa

HERBERT MEDALIST—MARTIN CARDENAS HERMOSA

MARTIN CARDENAS HERMOSA

An Autobiography

I was born in the City of Cochabamba, Bolivia, on November 12, 1899. At the age of seven, I started attending the primary school in Cochabamba. In my twelfth year I entered the high school, Sucre, also in the same City. In December 1917, I received the "Bachiller en Ciencias y Letras" degree, and in the following, I enrolled at the Universidad de San Andres in La Paz for the 4-year course at the Instituto Normal Superior in the Section of Biological Sciences.

In 1921, just four months before graduation date, I joined the Mulford Biological Exploration Expedition of the Amazon Basin under the direction of the late Doctor of Medicine and plant scientist, Dr. Henry Hurd Rusby, as the Bolivian Government associate. After nearly one year of plant science exploration in the Amazon Valley with Dr. Rusby and the plant scientist of that Expedition, Dr. Orland E. White, I returned to La Paz, and was awarded the Professor of Biological Sciences degree.

From 1922 to 1930, I was lecturer in Biological Sciences at the Instituto Normal Superior at La Paz, where I taught my students with particular reference to the flora of Bolivia. During 1931 I visited Chile and attended the various sections of the Museo de Historia. From 1932 to 1933 I was Director of a High School in the famous City of Potosi and there had the opportunity of collecting plants in the high Andes.

From 1934 to 1935, I joined our armed forces then engaged in the Chaco War; serving as a member of the Sanitary Corps.

In 1935, I was sent by the Bolivian Government to the U. S. Department of Agriculture, Washington, D. C. in order to study the possibilities of optimum culture of *Cinchona* species in Bolivia. I was already familiar with the subject on the basis of my plant explorations of the *Cinchona* forests in the Department of La Paz. These explorations were undertaken at the request of the Bolivian Government at the time of the Chaco War with the objective of establishing a quinine factory at La Paz.

In 1937, I was elected Rector of the Universidad de San Simon in Cochabamba, and was awarded the Doctor in Sciences "Honoris Causa" degree. Since 1937, I have been lecturing at the Universidad de San Simon on plant science, genetics, plant pathology and economic plant science.

In the years 1938, 1948 and 1958, I represented Bolivia at the three South American Plant Science Congresses. I resigned the University Rectorship in 1946, but have continued lecturing. In 1948, I attended the Amazon Hylaean Conference as President of the Bolivian Delegation. During the same year, I was also Bolivian Delegate to the Natural Resources Conference which convened at Denver, Colorado. In 1944, I was invited by the British Council to spend one year at the

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University of Cambridge in connection with potato research work at the School of Agriculture. From September to December 1945, I was the guest of the U. S. Department of State, and had the opportunity of visiting several American universities and agricultural experiment stations. I have attended the Latin American Conferences of Phytotechnicians held at Bogota in 1955, at Santiago in 1958, and at Lima in 1964. In 1960, I traveled in various countries of Europe, visiting museums and making lineagic revisions at some of the herbaria, particularly at those of Kew and Paris. In 1963, I again visited Europe during the summer and attended the IOS Congress at Vienna as President.

During my vacations, I have traveled through almost all of the South American countries, interested always in plant science exploration. When opportunity offered, during 35 years, I have traveled in the interior of Bolivia; collecting plants and taking photographs of plants and of objects of ethnological importance. I have collected nearly 6,500 numbers of Bolivian plants, including several duplicates which have been sent to various foreign herbaria.

Since 1930, I have been engaged in plant taxonomy; becoming a specialist in the grouping of the Bolivian Cactaceae, *Solanum* (Tuberarium), *Amaryllis* and economic plants. I have proposed four new genera, and 120 new species of Bolivian Cactaceae, seven new species of *Amaryllis*, and 20 new species of wild potatoes.

My vocation of plant science began when I was a high school student under the direction of a teacher who asked us to make herbarium specimens although he was not able to identify them. After my graduation from the University, my tour with the Mulford Expedition as Dr. Rusby's assistant, completed my field training, and my capability of identifying the families of plants. My main specialty has been the Bolivian flora. My diagnoses of new taxa have appeared in various specialized periodicals in Europe and the United States. Some of my cactus diagnoses have also been published in our REVISTA DE AGRICULTURA. I plan to write a monograph on the Bolivian species of *Amaryllis*, and also monographs on Cactaceae, wild potatoes, and various economic plants.

I have been awarded several high distinctions, including the Universidad de San Simon Meritus Medal, the Mary Soper Pope Medal, and the First Interamerican Agricultural Medal. I have been honored with election as corresponding member of the American Botanical Society, Life member of the Potato Association of America, and Foreign Member of the Linnaen Society of London. And now I am honored by the receipt of the William Herbert Medal of the American Plant Life Society.

At present I am Director of the Department of Applied Botany and Lecturer in general genetics at the Universidad de San Simon in Cochabamba.

June 28, 1966,
Universidad de San Simon,
Cochabamba, Bolivia.

COLLECTING AMARYLLIS IN BOLIVIA: REMINISCENCES OF MY ASSOCIATION WITH PROF. IRA S. NELSON

MARTIN CARDENAS, *Bolivia*

My particular interest in collecting and studying *Amaryllis* species began in 1954, when Prof. Ira S. Nelson, of the University of Southwestern Louisiana, visited me at the Department of Plant Science at the Universidad de San Simon, in Cochabamba, and requested information about the herbarium material and living *Amaryllis* plants at our institution. Then I realized that I had collected several *Amaryllis* species in connection with plant science exploration since 1921, when I was a member of the Mulford Expedition into the Amazon Basin.

Prof. Nelson received from me several bulbs of unidentified amaryllids, which were later described as *Chlidanthus boliviensis* Traub & Nelson, *Amaryllis mollevillquensis* Cardenas, and some forms of *Amaryllis belladonna* L. Encouraged by the work of Prof. Nelson, my interest in this group of plants increased very much, and since that date I have brought into cultivation quite a number of amaryllid species, and also interspecific hybrids made by myself. In 1958, Prof. Nelson made a second trip to Bolivia, and I became associated with him.

In October 1958, we made a very interesting trip to San Ignacio de Velasco where we saw many clonal forms of *Amaryllis divigranciscii* Cardenas, and also two different forms of *Amaryllis belladonna* L. We spent nearly two weeks as guests of the Franciscan Mission of San Ignacio, and we were assisted particularly by Padres Lorenzo Hammerschmidt and Carlos Probst. Padre Lorenzo accompanied us in all our journeys in the vicinity of the Mission. On November of the same year, I planned for Prof. Nelson a long trip to the Yungas of La Paz, where I expected interesting findings. This journey through La Paz, El Chaco, Chulumani, Rio Solacama, Irupana, Miguilla, and Espia required five days. At El Chaco, we collected what appears to be *Amaryllis forgetii* (Worsley) Traub & Uphof. At Rio Solacama, we discovered the new species now known as *Amaryllis yungacensis* Cardenas & Nelson. When we arrived at the extremely broad bed of the La Paz River, I pointed out to Prof. Nelson the place named Espia across the River. At the time of the Mulford Expedition we had camped there. This spot is actually covered by inaccessible bushes, and is the type (nomenifer) locality of the so-called "Lepidopharynx deflexa Rusby". We discussed the possibility of crossing the three fords of the River between us and Espia in order to obtain bulbs of the amaryllid already mentioned. The River was in a frightening state of flood. It was now a question of going back to Irupana where we had to spend the night, or attempt to cross the river fords in order to reach Espia, where 37 years in the past "Lepidopharynx" was collected by Rusby, but apparently no one had collected there since that time. After considering the matter carefully, Prof. Nelson decided that we make the crossing to the place which was 300

yards across the raging River. When we were crossing the second ford in the river, I was frightened when the water reached the height of the engine of our jeep, but fortunately the engine did not stop, and we reached our objective which was several bulbs of "Lepidopharynx deflexa" at its very type (nomenifer) locality.

When we came back to La Paz, Prof. Nelson would have liked to go on to Apolo in search of the green-flowered *Amaryllis viridiflora* (Rusby) Traub & Uphof. Unfortunately, it was the beginning of December and the rainy season was coming up.

By the middle of 1959, I was notified by the Interamerican Institute of Agriculture at Turrialba, Costa Rica, that I was awarded the first Interamerican Agricultural Medal and was to receive it in April 1960. When I informed Prof. Nelson of this matter, he asked me in the name of the Louisiana Society for Horticultural Research, to go on from Costa Rica to Lafayette and address the members of the Society at the Annual Meeting in March of 1960. I brought along several herbarium specimens for Prof. Nelson; among them one unique labeled by me *Amaryllis crociflora* (Rusby) Traub & Uphof.

The subject of my address at the LSHR Annual Meeting was on Bolivian *Amaryllis* which was illustrated with several Kodachrome slides. I spent a week as the guest of Prof. and Mrs. Nelson, who graciously offered me their hospitality and the shelter of their home during my stay at Lafayette.

In 1963, I received a letter from him reporting that the bulbs collected at Espia had flowered, and that it was in fact a form of *Amaryllis cybister* (Herb.) Traub & Uphof. I was astounded by this news, and thought at first that it might be due to an intermixture of labels. However, after looking at the original published illustration made from a drawing based on an ink sketch, I also came to the conclusion that it was in fact a form of *Amaryllis cybister*. I wrote to Dr. Steere, a friend of mine, and director of the New York Botanical Garden, asking for a photograph of the type (nomenifer) specimen of *Lepidopharynx deflexa* Rusby. This arrived in July 1965, when I was invited to attend in Mexico the 49th Annual Meeting of the American Potato Association and to address the members on "The Potential Germplasm of Native Potatoes in the Andes." After this meeting I decided to go on to the United States to visit some plant science colleagues, and then to go eastward to New York City where I would enjoy the World's Fair.

By the beginning of September 1965, I had made two visits to the New York Botanical Garden, and I saw the type (nomenifer) specimen of *Lepidopharynx deflexa* Rusby, which as anticipated was a true form of *Amaryllis cybister* (Herb.) Traub & Uphof. I left a label on the specimen giving the true name.

After stopping off in Brasil, I searched in the Organ Mountains at Teresopolis, near Rio de Janeiro, for *Amaryllis calyptrata* Ker-Gawl. I found it on a tree with a ripe seed-pod.

I returned home to Cochabamba by the beginning of October, and was anxious to write to Prof. Nelson about the interesting findings with

regard to *Lepidopharynx*, when I received a cable from the Dean of the Horticultural Department of the University of Southwestern Louisiana reporting the tragic death of Prof. Nelson in an automobile accident on the way between New Orleans and Lafayette. The news distressed me very deeply. The thought flashed into my mind that we were exchanging plans on the preparation of the handbook for Amaryllis Breeders which was intrusted to him by the University. I also realized then that in the United States there were only two plant scientists extensively acquainted with the amaryllids—Dr. Traub and Prof. Nelson; and that there remained unexplored spots in the Peruvian and Bolivian Andes where there still remained undiscovered *Amaryllis* species.

Prof. Ira S. Nelson and myself were very cordial friends and we had in common the background of exploration for new *Amaryllis* species. I had always admired his accuracy in the valuation of the lineagic differences in these very beautiful flowering plants growing unfortunately sometimes in inaccessible places.

June 20, 1966
Universidad de San Simon,
Cochabamba, Bolivia

IN MEMORIAM—IRA SCHREIBER NELSON, 1911-1965

Ira Schreiber Nelson, who received the William Herbert Medal Award for 1960 (see Autobiography, Plant Life 16: 6—9. 1960), died on November 14, 1965, as a result of injuries sustained in an automobile accident.

Ike, as he was known to all, was born in 1911 in St. Joseph, Mo. He received his B.S. and M.S. degrees in Horticulture from Iowa State University, and undertook additional graduate studies at the University of Missouri and Cornell University. Professor Nelson joined the University of Southwestern Louisana faculty in 1941.

He immediately became actively engaged in all phases of ornamental horticulture, spreading his contagious enthusiasm for the Louisiana iris, and he produced several hybrids. He was a Fellow of the American Camellia Society, recipient of the Herbert Medal, recipient of the American Horticultural Society in 1964 (citation), recipient of Silver Seal of the National Council of State Garden Clubs, 1958, and Research Director of the Louisiana Society for Horticultural Research.

Ike is widely recognized for his plant exploration trips, the naming and/or introducing to cultivation of *Amaryllis evansiae*, *A. starkii*, *Childanthus boliviensis*, *Habranthus cardenansiana*, and the red Bolivian passion flower *Passiflora coccinea*. He was actively engaged in hybridizing *Amaryllis* species and cultivars. Numerous seedlings, as yet not evaluated or flowered, will be released by the University in the future as a living tribute to this renowned horticulturist.

He was instrumental in building and developing one of the finest collegiate ornamental horticulture centers in the South. This center now bears his name.

Professor Nelson devoted 25 years of his energetic life to teaching, counseling and advising young men and women at Southwestern. His total influence on the lives of these many students can never be fully estimated.

He is survived by his wife, the former Barbara Furnass, and four children, Martha, Leah, Katherine and Jimmy.

August 5, 1966, *James A. Foret*
University of Southwestern Louisiana,
Lafayette, La.

JOHN WILLIAM FRANCIS HARRISON, 1901-1966

Mrs. Morris Clint, *Texas*

William John Francis Harrison was born June 21, 1901 in Baysville, Muscoca, Ontario. He was known to his many friends as Frank (for Francis) Harrison. In 1912, he moved with his family to the city of Chatham, in southern Ontario. After completing his elementary education, he entered Chatham Collegiate Institute. Due to the manpower shortage, he worked for a nurseryman and florist during the last two summers of World War I. After his graduation from the Institute in 1918 or 1919, he continued to work full time in this position.

Even as a small boy, Frank was keenly interested in nature. He was a proficient fisherman, loved animals and was almost obsessed with all kinds of plant life. He not only brought home from the woods and planted many plants and trees, but was always ordering rare seeds from nurseries in the United States. He must have been born with a green thumb, for he was apparently more than successful in coaxing these rarities to grow and thrive.

He was an avid reader and was fortunate in having lots of material both in his home and in the Public Library. No doubt this extensive reading fostered the wanderlust that hit him about 1923. He worked in California for 18 months on the viaduct then being built to provide water for the city of Los Angeles. He returned to Canada in 1925 for a visit with his family and then set out for Mexico.

Whether he traveled over Mexico before settling down is not clear. I do know that in the course of his life there he saw a good part of Mexico. He first settled in the town of Chamal, in the state of Tamaulipas, where there was quite a large American colony. He taught school there and started a fruit farm in one of the nearby valleys. Disaster struck in 1933. In September of that year a severe hurricane destroyed his farm and he contracted a debilitating form of Malaria. His health began to fail and he was advised by his doctor to move to a higher elevation.

In 1935, Frank bought about 60 hectares of land on Cerro del Tigre, in the Sierra de Cucharas, about 8 miles west of Gomez Farias, Tamaulipas, just a few miles south of the Tropic of Cancer, and settled down in the fairyland he called "Rancho del Cielo." He planted a few fruit trees (apples, pears, peaches and plums, since it was too

cool for the more tropical fruits such as bananas, Avacado and Mango, which were raised in quantity around Gomez Farias), bought a few cows, and built himself a rough cabin and a small lath house for his rare plants and seedlings. For his livelihood, he sold fruit and milk (and later Amaryllis bulbs) to the local people. Just when he became so interested in *Amaryllis* is not clear—nor where he acquired his original start of bulbs—but I would guess that it was not long after he moved to the mountains. I do know that he periodically visited nurseries in Ciudad Victoria and other cities of Mexico, ordered seeds from this

Fig. 2. Frank Harrison with bouquet of **Agapanthus** from his garden and **Magnolia** blossoms from the surrounding forest. Photo by Mrs. Barbara Warburton.

country and from Holland, and was furnished seeds and pollen by friends in the United States. It was not long before he had a good stock of bulbs, for his seedlings matured very quickly. From the beginning, he was careful to rogue out the "corrientes" as he called his inferior clones, and he worked continuously on improving the quality and color range of his strain.

I don't know just when the first group of American scientists visited Frank, but it was probably during the 1940s. In any event, the word soon spread and Frank was forced to build a guest house for

these visiting dignitaries. Later, a second and larger cabin was built. This unique area is a bonanza for students of all the natural sciences: its strange mixture of tropical and temperate plant genera and species whose area of distribution lie far to the south or far to the north, its rare and abundant wild life of all kinds, its unusual geological formation and its wealth of Indian mounds. Frank was much more than a competent guide for the area, for the mountain was an open book to him. He knew which barranca was the home of a certain rare new species of Echeveria or what cave housed a strange species of bat or

Fig. 3. Mrs. Betty McInnis and Frank Harrison showing part of rock fence and one of Frank's Begonias; taken at Rancho del Cielo; February 1960.

where to look for the best Indian mounds. He was to learn much from the scientists, also. Incidently, the first rule one must learn at Rancho del Cielo was never to venture alone into the forest, even for a few yards, for fear of getting lost.

Although Frank kept busy and made many friends on the mountain, it must have been a very lonesome life until Fred and Katherine Blesse of Brownsville leased a small piece of land on the clearing near Frank's cabin and built a rough but comfortable cabin where they spent more than half the year. This was about 1951. It was through the Blesses and their guests that we first began to hear about Frank's mountain

paradise, his Amaryllis and Frank, himself. We soon connected him with the W. F. Harrison who had written on growing Amaryllis in Mexico in Herbertia, Volume 14, page 23.

In 1955, a small group of hunters and sportsmen from Brownsville built another cabin on Frank's ranch. Among them were Gordon and Betty McInnis, of Brownsville, who fell in love with "The Mountain" and soon became fast friends with Frank. Other frequent visitors were John and Carolyn Hunter, also of Brownsville. It was through these two couples that we met Frank. We found him to be a very unusual person—quiet and unassuming, he was one of the most genuine persons I have ever met, generous to a fault, kindness itself. He never quarreled or raised his voice and disliked hearing others do so. If sharp words broke out in camp, he would slip quietly away, mumbling something like "got to see about a cow". Meantime, Frank became a frequent visitor in Brownsville. Every Christmas and usually once or twice more during each year he was in Brownsville visiting one or more of his friends.

On numerous occasions, we were urged to make trips to the mountain but to be truthful the hard grueling trip up the mountain by Jeep (at least 2 or 3 hours to cover 8-10 miles) scared us off for quite a while. In addition, we thought there surely must be a touch of exaggeration to the stories of the beauty and charm of Rancho del Cielo. Finally, however, a trip was arranged with John and Carolyn Hunter for the weekend of January 28th, 1957. We have traveled widely over Mexico and have seen many beautiful and interesting places, but from the moment we forded the Rio Sabinas, at the foot of the mountain, we found ourselves in another world. Although someone more gifted with words than I could paint an accurate picture of the place and a movie camera could capture much of it on color film neither could reveal the fascination and charm of the place. The trees are tremendous, from 60 to 130 feet tall, with trunks towering up to 90 feet or more before branching and up to 9 feet in diameter at the base. A species of Red Bud was in bloom, but so high in the sky that we could only get glimpses of them at times in the distance. The lower vegetation was covered with a pale green moss, giving the most eerie effect. Magnificent specimens of *Begonia heracleifolia* were in bloom among the large rocks on either side of the road, with flower trusses often 5 to 6 feet tall. There were large stands of the same tall, black-stemmed, upright maidenhair fern which had so enchanted us at Xilitla, far to the south. John pointed out large tree ferns, which we had so far never seen in the wild and certainly did not expect to find this far north. A beautiful *Chamaedorea* palm was so graceful that we thought at first it was the lovely narrow-leaved *Ceratozamia* species native to Frank's mountain.

The trip up the mountain had taken a long 5 hours, for we had gotten lost several times, and Rancho del Cielo was a welcome sight. The Amaryllis field was a blaze of color. We were pleased at the overall fine quality of the flowers and found the vigor of the bulbs amazing. Each clone had formed a huge clump of bulbs—a characteristic which makes them invaluable for garden planting, and prolongs the blooming

period. We understand that Frank's *Amaryllis* bloom from late January into May. We had been so busy looking at the *Amaryllis* blossoms that we did not see the Freesias until Frank called our attention to them. They had naturalized all over the field! *Lilium formosanum* had escaped and was established all over the clearing and was even invading the forest. I believe Frank said they bloomed off and on over the year. Frank's *Sprekelia* in two forms were blooming with abandon and *Watsonia* in several shades were a beautiful sight. When we mentioned the *Begonia* we had seen coming up the mountain, Frank proudly showed us his hybrid of this species, which was a much superior plant with larger flower trusses and flowers of a much deeper color. Frank was also interested in *Gloxinia* and grew these to perfection in his lath house. As we walked around, we noted that the trees were lavishly decorated with bromeliads and Orchids of all kinds. We were astonished to find that when any of these epiphytes were dislodged from a tree, they continued to grow on the ground, which is most unusual. The general landscaping now includes *Fuchsia*, *Azalea*, *Camellia*, *Gardenia*, *Calla (Zantedarhia)* and *Agapanthus*, all of which thrive and bloom beautifully. *Cymbidium* Orchids have been mass planted along one of the rock fences. *Impatiens* and Chinese forget-me-not re-seed and bloom almost all year. *Gladiolus* and *Gloriosa* have both naturalized. Guava and Orange trees supplement the fruit supply and there is now a large black walnut tree. Many of these plants Frank raised from seed.

Frank's ranch is situated on a uneven limestone plateau with an elevation of 3500 feet. Cerro del Tigre continues to rise north west of the ranch to an ultimate height of around 8000 feet, thus protecting the property from most of the northers during the winter. Until 1951, when the temperature got down to 23 degrees, his lowest temperature was only 28. The geological formation of this Sierra is unusual, for it is a mass of "tumbled" limestone with literally no bottom. There are numerous sink holes and many caves. Rancho del Cielo has one of the few good springs on this strange mountain of few springs and no creeks. Since the annual rainfall is from 70 to 130 inches, we have often wondered what happened to all of this water. I believe we solved the mystery a few years after our visit there when we saw the tremendous underground river which roars out of the mountain near Cuidad Mante, some 35 miles or so to the south, and furnishes irrigation to the lush farming area for miles around. The unique forest of Sierra de Cucharas is the most northern representative of the middle American cloud forest formation, and reaches a peak on or near Rancho del Cielo. Areas on either side of the Sierra are very dry and desert-like. On or near Frank's place there are at least 5 species of oak, 2 of red bud, hickory, Podocarpus, beech, maple, Magnolia, sweet gum, and many others. Several species of pine start around 5000 feet.

Mr. Hunter bought the Blesse cottage after Mr. Blesse's death. He is one of the trustees for Texas Southmost College, of Brownsville, so it rather naturally followed that small groups of students were frequently invited down for week-end laboratory study. About 2 years

ago, 3 buildings were erected for an Ecological Station by the College on land leased from Frank. The venture was so successful that Frank expressed a desire to will all of his property to the College so that it would be preserved and always available for research. Since this was legally impossible in Mexico, lawyers advised the formation of a non-profit corporation under Mexican law for the purpose of holding the property for educational use. The corporation was duly formed and in July, 1965, Frank deeded his land to the corporation, reserving active control of the entire property for as long as he lived. Frank was extremely happy over the transaction. I shall quote several passages from a letter by John Hunter to one of Frank's sisters, Mrs. Nellie McKay: "Frank wanted to have the property accurately surveyed and

JOHN WILLIAM FRANCIS HARRISON

BORN BAYSVILLE ONTARIO CANADA JUNE 21 1901
MURDERED RANCHO DEL CIELO MEXICO JAN 29 1966

A SINCERE STUDENT AND GIFTED TEACHER

TO HIM WHO IN THE LOVE OF NATURE HOLDS COMMUNION WITH HER VISIBLE FORMS

the week of January 24th (1966) a party of students and two professors from the College took down the official surveyor from Ciudad Victoria and ran the lines and established the corner markers officially. I was not present but the professors told me that Frank remarked that he was happy that this had been done as he felt that 'time is running out with me'." Poor Frank, it was, indeed.

The College party left Rancho del Cielo between 6 and 7 o'clock on the morning of January 29. Frank had breakfast with them and, as they drove off, left for his cabin to do the morning chores. Shortly afterward, he was waylaid and brutally murdered. The shocking news reached Brownsville about 10 o'clock Monday morning and by 1 o'clock a large party left for Mexico, carrying a casket with them. Various legal formalities and necessary arrangements were finally completed and

Fig. 5. Dr. Cooley, Mr. Olivet, Dr. Norton and Prof. Ballard inspecting hybrid **Hemerocallis** seedlings in the Washington-Maryland area. Photo by Mrs. Ben H. Nicolet.

Fig. 6. Left, Dr. Henry A. Jones, Mr. Olivet and Prof. Ballard inspecting hybrid **Hemerocallis** seedlings in the Washington-Maryland area. Right, Dr. John B. S. Norton at the Age of 94 years in 1966. Photos by Mrs. Ben H. Nicolet.

Frank was buried late Tuesday afternoon February 1st "directly in front of the main College building in one of the old Indian mounds that are so abundant on the mountain . . . the location is a beautiful spot. I know he will be an inspiration to many students for years to come."

The Mexican police did excellent work on the case. Within a few days they had arrested two suspects, found an eye witness, and obtained complete confessions. In less than a week they had rounded up the rest of the troublesome group. They were members of an extreme left wing section of the Agrarian movement who had been "squatting" on land close to Frank's ranch. They blamed Frank for the eviction notices which had been served on them that week by the authorities. Under Mexican law, Agrarians have no right to claim land used for educational purposes.

As a final tribute to the memory of a very fine person, I again quote from Mr. Hunter's letter: "I have often thought about the remarkable character of the man who could move into an absolutely secluded spot and over a period of 30 or 35 years build as many friendships as widely scattered and as closely felt as Frank was able to do. I have no man in my acquaintance who has the friends that he had."

EARLY HEMEROCALLIS BREEDERS IN THE WASHINGTON AREA

Mrs. Ben H. Nicolet, *4603 Tuckerman St., Riverdale, Md. 20840*

In the 1930's, I functioned as chauffeur in transporting Dr. John B. S. Norton on many field trips, including trips to the gardens of daylily breeders—including the gardens of Dr. Cooley, Dr. Schott, Mr. Olivet, Prof. Ballard, Dr. Traub's daylily plots at the U. S. Station at Beltsville, and other breeders in the Washington, D. C. area. These are happy memories.

I purchased the brilliant red daylily, 'Berwyn' from Dr. Cooley for $6.00 who was propagating daylilies at that time. This was as much of a plunge for me then as the purchase of a $25.00 clone is to me today. As I progressed with the times, I tried to keep samples of the old daylilies for history's sake, but I lost many of these last summer when the teenagers who do my garden work cleaned out the Bermuda grass that grew high while the drought dried down the daylily foliage. One of my favorites was 'Victory Taierschwang' and I had it in a setting of a lacy variety of "Dusty Miller". I felt that it had some fine qualities and had I been breeding daylilies, I would have tried to carry on its superb ability to withstand adversities of heat and storm and still remain unmarked and velvety.

Recently, some one had reported that Dr. Norton was ill, and I went to see him in February 1966. I send you proof that he wears his years handsomely. (Fig. 6.) I believe he is nearing 95 years. He is alert and talks well, but says he promptly forgets all temporary things while the most minute details of the past stay in his mind. [Dr. Norton died July 12, 1966.]

I enjoyed the California visit, including the visit to the fine spot on the Pacific where Dr. Traub lives. Our winter (1965-66) here in Maryland has been kind and after my return, the garden was brought into order. My species *Crocus* are now blooming, and I am considering the purchase of more daylilies.

IN MEMORIAM—MRS. EMMA LOUISE DAVIS HAYWARD

Mrs. Emma Louise Davis Hayward, 94, mother of Wyndham Hayward, Winter Park Horticulturist, died February 2, 1966, at an Orlando Nursing Home after a long illness. Mrs. Hayward was born in Providence, R. I., in 1871, the daughter of Henry Richard Davis who for more than half a century was secretary-treasurer of the Providence Journal Company. Her husband, Walter Hayward, who died in 1919, was on the editorial staff of the Journal. Before coming to Orlando in 1927, Mrs. Hayward was prominent in horticultural, civic and welfare work in Wickford, R. I., activities which she continued at her new home in Winter Park, Florida.

EDITOR'S MAIL BAG

The Secretary of the Royal Horticultural Society of London informed us under date of May 3, 1966, that Mr. H. W. Pugsley, the noted authority on *Narcissus*, and Herbert Medalist, died on November 18th, 1947, aged 79; and that an In Memoriam notice appeared on page 200 of the Gardeners Chronicle for December of 1947. The members will want to reread Mr. Pugsley's autobiography which appeared in Herbertia 7: 35-36, with portrait (plate 172), 1940.

Mr. Horace Anderson, 400 La Costa Av., Leucadia, Calif. 92024, an outstanding horticulturist and nurseryman, and authority on cycads has been appointed chairman of the Cycadaceae and Alstromerid Committees.

Mr. Wyndham Hayward writes under date of July 1, 1966, that he has sold his property in Winter Park, Florida, to the Presbyterian Church, which has erected a three million dollar retirement home in the Gentile Grove to the South. They will allow Mr. Hayward to live on his property for one additional year.

Dr. John B. S. Norton, 94, professor emeritus, University of Maryland, and specialist in plant pathology and plant lineagies, died July 12, 1966. See Fig. 6. Dr. Norton retired in 1942, and lived at 4922 40th Place, Hyattsville, Maryland. His many friends will greatly miss him.

Under date of October, 1966, Tucuman, Argentina, Mr. Leonard Doran, who is on a plant exploration trip in company with his mother, writes that he expects to find *Amaryllis* and other amaryllids in this area.

Mr. J. Leonard Doran, and his mother, Mrs. Cora B. Doran, 1117 N. Beachwood, Burbank, Calif. visited with the editor on Nov. 9, 1966.

They had recently returned from a plant exploration trip into South America as far down as Argentina.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1966 AMARYLLIS SHOWS

The Official Amaryllis Shows for the year 1966 began on March 27 with the Coastal Bend Amaryllis Show, Corpus Christi, Texas. Then followed the Official Men's Amaryllis Club Show, New Orleans, La., on April 16 and 17; the Official Show of the Greater Houston Amaryllis Club on April 17, and the Official Show of the Southern California Hemerocallis and Amaryllis Show.

Mrs. Sam Forbert, President, writes that the Hattiesburg, Miss., Amaryllis Society Show had to be canceled due to several factors, mainly the premature blooming of most of the bulbs, but they are planning for a quality show in 1967. Mrs. A. C. Pickard reports that the Houston Amaryllis Society Show was canceled due to unseasonably cold weather and excessive rainfall, which resulted in inferior blooms; and that they are looking forward to an excellent show for 1967. No reports have been received from the managers of Greater Gulf Amaryllis Show, and the New Orleans Garden Circle's Amaryllis Show, and it is assumed that these shows were canceled due to unfavorable weather.

COASTAL BEND AMARYLLIS SHOW, 1966

Mrs. Carl C. Henny, *President, P. O. Box 3054, Corpus Christi, Texas*

The Coastal Bend Amaryllis Society held its seventh annual Amaryllis Exhibit in conjunction with the Lola Forrester Flower Show which was held in the Exposition Hall March 26th and 27th, 1966. Due to a cold winter and spring, with little rain and sun, and also due to the fact that the Lola Forrester Flower Show was held about two weeks too early this year, our Amaryllis Exhibit was very small, with only 15 entries. Two of these were cut scapes and 13 were potted amaryllis. Just now (Apr. 11) many of our garden grown amaryllis are in bloom.

Among the Pot Grown Registered Leopoldi Type Amaryllis entered were: 'Apple Blossom', 'Royal Dutch', 'Boquet', 'Ludwig's Dazzler', 'Daintiness', 'Fire Dance' and 'Picotee'. Mrs. R. A. Hornberger, club member, received a blue ribbon on her pot grown 'Apple Blossom' and a yellow ribbon on her pot grown 'Royal Dutch' Amaryllis.

Mrs. Carl Henny received a blue ribbon on her cut scape American variety seedling.

Mr. R. L. Retallack received a yellow ribbon on his pot grown Belladona Type Amaryllis.

Mr. H. E. Lemoine received a blue ribbon on his pot grown "Constant Comment" Miniature Gracilis, and a red ribbon on his pot grown

'Pamela' Gracilis Amaryllis. Mrs. Levi Materne received a red ribbon on 'Sparkling Gem' Miniature Gracilis, pot grown.

Mrs. R. A. Hornberger, club member, scored 97 points on her 'Apple Blossom' pot grown amaryllis and was awarded the "Ludwig Challenge Trophy". Mr. S. C. Tumlinson, a non-member, received a blue ribbon and the "Award of Merit" Ribbon on his 'Daintiness' pot grown amaryllis, which scored 98 points.

Fig. 7. Mrs. R. A. Hornberger received the "Ludwig Challenge Trophy" for her hybrid **Amaryllis** clone 'Apple Blossom' which scored 97 points.

Those receiving the American Plant Life Society "Award of Merit" were: Mrs. R. A. Hornberger, on "Apple Blossom"; Mr. H. E. Lemoine, on "Constant Comment" Gracilis; and Mr. S. C. Tumlinson on "Daintiness".

Mr. Harvey Vogt planted amaryllis seeds and potted 80 seedlings which were distributed to those at the flower show who were interested in growing amaryllis.

Three Accredited National Amaryllis Judges from San Antonio, Mrs. Sam Montgomery, Mrs. Larry Miller and Mrs. Frank Hopwood, judged our Exhibit. Five blue ribbons, 4 red ribbons and 2 yellow ribbons were awarded, making a total of 11 ribbons awarded. The quality of the entries was good despite the small number of amaryllis exhibited.

I am enclosing a picture of Mrs. R. A. Hornberger with the Ludwig Challenge Trophy and the award winning pot grown amaryllis, "Apple Blossom" and "Daintiness".

OFFICIAL MEN'S AMARYLLIS CLUB OF NEW ORLEANS SHOW, 1966

JAMES E. MAHAN, *Show Standards Chairman.*
3028 Palmyra St., New Orleans, Louisiana 70119

The Men's Amaryllis Club of New Orleans, Inc., held its seventh Official, All Horticulture show on Saturday and Sunday, April 16th and 17th, 1966 at the Edward Hynes School in New Orleans. As in the past, attendance was quite representative, visitors having come from

Fig. 8. Part of the exhibits at the 1966 Official Amaryllis Show staged by the Men's Amaryllis Clubs of New Orleans.

many neighboring cities and states; and the consistently high quality of the entries in competition was very gratifying to all.

The show was staged this year according to the nine divisions as defined by the American Amaryllis Society with separate sections for Registered and Named, Unregistered and Unnamed, Species, and Unregistered but named specimens for both cut specimens and potted specimens. It was felt that this is a more realistic approach toward classification of the entries in contrast to classification according to country of origin as had been done in the past. The usual first, second, third and honorable ribbons were awarded along with trophies and sweepstakes ribbons for outstanding entries.

The following trophies and sweepstakes ribbons were awarded: the Walter Latapie Award for the best registered and named specimen to Mr. W. J. Perrin; the Rose Garden Center Award for the best unregistered and unnamed specimen to Mr. W. J. Perrin; the Alatex Construction Service, Inc. award for the best home-bred, grown and developed specimen, either registered and named or unregistered and unnamed to Mr. E. M. Beckham; the James Mahan award for sweepstakes winner in registered and named potted specimen to Mr. E. M. Beckham; the Reuter Seed Company, Inc. award for sweepstakes winner in unregistered and unnamed potted specimen to Mr. E. M. Beckham; the Swetman Amaryllis Garden award to Mr. E. M. Beckham for the most blue ribbons in the registered and named sections, potted and cut scape specimens; the President's Trophy for the most blue ribbons won by a member of the Men's Amaryllis Club of New Orleans, Inc. to Mr. Milo Virgin; sweepstakes ribbon for most blue ribbons won in registered and named potted specimens to Mr. E. M. Beckham; sweepstakes ribbons for most blue ribbons won in unregistered and unnamed potted specimens to Mr. Milo Virgin; and a cup to the best single floret specimen entered in a special section open to members of the Men's Amaryllis Club of New Orleans, Inc. only, to Mr. Stephen Gaspereez.

Mr. Norman Clements acted as Show Chairman with Mr. W. C. Creevy as co-chairman and both discharged their duties admirably. Judging was done by nine accredited judges in three panels of three judges each and the thanks of the club go out to them for their very competent judging and attention to all entries.

An added attraction to the show this year was the setting up of two simulated garden beds in the entry hall to the show with the main attraction in the beds being, of course, amaryllis in bloom. Various other plants were included and even several small trees as a natural background for an outdoor amaryllis garden bed. Sides were built up along the perimeter of the bed with peat moss used as filler to simulate a garden soil. Comments were many and favorable on this idea conceived by our member, Mr. W. J. Perrin, and ably carried out by him with the assistance of member W. C. Creevy. It is hoped that this feature will be continued in future shows and perhaps even enlarged since it received such praise from the visiting public.

OFFICIAL SHOW OF THE GREATER HOUSTON AMARYLLIS CLUB, 1966

Mrs. Sally Fox, *Corresponding Secretary*

"Doublegood" is the most descriptive word to use when The Greater Houston Amaryllis Club had its annual official show in conjunction with The Mens Garden Club Spring Show. The show had been scheduled for April 17th, but due to cool nights and some overcast days the blooms did not develop sufficiently to warrant a show on that date. The Club

asked the Mens Garden Club if they could join them the following Sunday, April 24th, when they held their Spring Show, and were welcomed enthusiastically to have their display in the adjoining Rose Room of The Garden Center.

Unfortunately the seven days were disastrous to gardens with high winds and continuous rain, and although brilliant blooms were displayed in a garden-like setting in the Rose Room to an overflow crowd, the Judges in line with their rules, were not able to give high enough scores to warrant the silver trophies. Only entries in three divisions scored 95 or better. Mrs. A. G. Horsfall won The Greater Houston Amaryllis Club silver trophy for best Dutch specimen in the show with a cut specimen "Royal Dutch", as well as an Award of Merit from The American Plant Life Society. She was awarded the Ludwig Challenge Cup for this same entry, which is given by the Holland hybridizer for the best Ludwig specimen. Kermit L. Warnasch scored 95 for a miniature "Firefly" but since there were only two entries in this class no trophy was given. Mrs. Charles H. Pease scored 97 for an Amaryllid species, but this too was the only entry in this division.

Fig. 9. Official 1966 Amaryllis Show of the Greater Houston Amaryllis Club: left to right, Mrs. A. G. Horsfall, Trophy winner; Mrs. Charles H. Pease, Staging Chairman, and Club President; Mrs. W. S. Wheeler, Vice-Chairman and 1966-67 President; and Mrs. Sally Fox, Show Chairman and 1966-67 Vice President.

Mrs. Charles H. Pease prepared the educational exhibit, which was most outstanding. She was quite pleased to answer numerous questions to interested guests.

Many new Amaryllis lovers were gained through this joint show, as the Mens Garden Club also has quite a number of Amaryllis growers who displayed beautiful specimens competing for the Ludwig Challenge Cup. Judges of the Amaryllis Division of the Mens Garden Club show

selected "Apple Blossom", entered by Kermit L. Warnasch, as the best Ludwig specimen to win the Ludwig Challenge Cup. Mr. H. T. Long was a close second with White Christmas. Mr. Warnasch also won an Award of Merit for a magnificent specimen "Floriade" which was the showpiece of this division.

Mrs. Sally Fox was General Chairman, with Mrs. W. S. Wheeler as Vice Chairman. Both felt the event was well received as the visitors didn't notice the absence of the silver trophies since they were able to view many, many blue ribboned specimens.

Yes, it was a "Doublegood" event long to be remembered.

Fig. 19. 1966 Southern California Official Amaryllis Show: W. Quinn Buck's exhibit of hybrid Amaryllis clone 'Wyndham Hayward' for which he received the "Ludwig Challenge Trophy." Photo by Jack V. McCaskell

1966 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

Mrs. Bert Williams, *Show Chairman,*

2601 La Presa, South San Gabriel, Calif. 91777

An Amaryllis Show far better than the preceding year's was held at the Los Angeles State and County Arboretum, 301 N. Baldwin Ave., Arcadia, Calif., on May 14 and 15, 1966, again sponsored by the Southern California Hemerocallis and Amaryllis Society. The show com-

mittee had spent anxious weeks preceding the show because the warmer spring had made so many growers report that their bulbs had all bloomed long before the show date. Everyone was happily surprised at the really fine array of spikes assembled, a big percentage coming from several large growers.

The whole lecture hall of the Arboretum was well filled with many tables for the seven divisions, which included cut spikes as well as potted material. There were 95 competing exhibits, in addition to the hundreds of non-competing displays. A special feature was the impressive group of amaryllis arrangements contributed by Chadwick Gardens, florists of Redondo Beach, Calif., who also displayed very high quality cut spikes, including some lovely pinks and picotees, as well as some superb potted seedlings.

Another special feature was the group of spikes of the Howard & Smith strain furnished by Paul J. Howard's California Flowerland, which is to be closed because of Mr. Howard's death in the spring. This may have been the last time that so many spikes from this famous strain will grace our show.

Fig. 11. 1966 Official Southern California Amaryllis Show: part of the exhibits. Photo by Jack V. McCaskell.

The Cecil Houdyshel Perpetual Memorial Trophy, a handsome silver Revere bowl, was awarded to Mr. W. Quinn Buck as the sweepstakes prize. Mr. Buck was given a small replica of the large Trophy for having won it at the 1965 show also.

The Ludwig Challenge Cup, a handsome trophy from Ludwig & Co., Hillegom, Holland, for award to the best specimen exhibited of one of their varieties making a score of not less than 95 points, went to Mr. W. Quinn Buck for his potted 'Wyndham Hayward', which the judges gave 98 points.

For the best single cut specimen a silver tray was awarded to Mrs. Eva Turnquist. Mr. Gilbert Nash was runner-up in this class with one of his fine cut spikes, and he received a copy of the Peggy Schulz book on Amaryllis culture.

Fig. 12. 1966 Official Southern California Amaryllis Show: arrangements from Chadwick Gardens, Redondo Beach, Calif., **upper right** low flat bowl arrangement combining **Cymbidium** blooms with large salmon **Amaryllis** flowers; **upper left,** arrangement of picotee **Amaryllis** seedlings combined with several types of handsome foliage, accented with a cluster of pepper fruits; **lower left,** tall arrangement of salmon-scarlet **Amaryllis** and clipped **Cyperus** foliage, accented with peppers, and imported porcelain duck; **lower right,** tall arrangement of **Amaryllis** in harmonizing tones of rose-purple, combined with Cymbidiums and beautiful **Asparagus** foliage. The colors of the **Amaryllis** made this the most beautiful group in the show. Photos by Jack V. McCaskell.

Those winning most blue and purple first place ribbons were Mr. W. Quinn Buck, Mrs. Eva Turnquist, Mr. Sterling Harshbarger, Mr. Gilbert Nash, Mr. H. F. Colby, and Chadwick Gardens.

Two special awards were made, rosettes going to Mr. Leonard Doran for his bouquet of a beautiful *Zephyranthes* species collected in Peru on one of his trips; and to Chadwick Gardens in recognition of the great merit of their superlative amaryllis arrangements.

American Amaryllis Society awards included an Award of Merit to Mr. W. Quinn Buck for his specimen of 'Wyndham Hayward'; and Preliminary Commendations for meritorious seedlings exhibited went to Mr. Gilbert Nash, Mr. Sterling Harshbarger, and Mrs. Kenneth B. Anderson.

Three tables of daylily flowers were shown by W. Quinn Buck. The warmer spring weather had brought many of the earlier types into bloom by this date. Many fine large tetraploid seedlings were shown, and these were foiled by types with bold, dark eyes that made wonderful contrast.

HOUSTON AMARYLLIS SOCIETY

Mrs. A. C. Pickard, *Chairman, Official Show Standards*

The Houston Amaryllis Society show was cancelled for 1966 due to unseasonably cold weather and excessive rainfall. This resulted in inferior blooms throughout the blooming season.

As for the gardens, they are mostly small, though very distinct. All of them are large enough to contain a representative collection of the finest Dutch hybrid Amaryllis now available in the world.

When the gardening public can see the results of the ability of the bulbs to adapt themselves to adverse conditions, it is the best vehicle to demonstrate the quality for the exhibitor.

We are looking forward to a favorable Amaryllis Season in 1967 and to offering the public another official Amaryllis Show.

WHO JOINS THE AMARYLLIS ROUND ROBINS?

Mrs. Fred Flick, *Carthage, Indiana 46115*

People from many walks of life, and of many professions, have been, or are, members of the Amaryllis Round Robins.

There have been busy housewives and mothers who find time to grow their favorite flowers; a young lad of fourteen, who founded the Gloxinia Society, and grew up to become a magazine editor and author of horticultural books; the retired business man who has started a new business of growing and selling orchids; school teachers who grow flowers in their class rooms; a busy family man and eye doctor, who finds relaxation in caring for his flowers; the beautician who wrote a number of horticultural books; the young man in Texas, having earned his doctorate

has come to an Indiana university to teach; the Canadian housewife who grows many flowers and vegetables; all ages and with varied interests, but all enjoy the beauty of the Amaryllis.

Members are lost due to various reasons; lost interest; old age; ill health and death. The first Amaryllis Robin was started twenty-five years ago with three members, only one of the three is still active; the present Robin director. At one time there were eleven very active Robins flying; at the present time there are five active Robins. Young members are needed at present, so that the Robins may be kept flying for another twenty-five years.

BEAUTY FOR THE BLIND

Mrs. Sally Fox, *Houston*

HAPPINESS is a Club Project! During the Spring of the 1964/65 year, a group from the Greater Houston Amaryllis Club, with Mrs. Jesse Haver as Chairman, took Amaryllis blossoms from their yards and visited the Lighthouse For The Blind, whose Garden Club membership is about twenty-eight members. Each Lighthouse member was given a blossom. Some members of the Lighthouse Club are blessed with a small amount of sight, where others must rely on their other senses. We felt the Amaryllis would be an ideal bulb in which to interest these handicapped persons since the blooms are unusually large, heavy textured, and often have a faint scent—and their sensitive fingers could behold the beauty of the amazing Amaryllis. After the meeting, refreshments were served by Mesdames R. A. Faweett, T. L. Lawler, Glen Melton and Mrs. Haver.

The response was so enthusiastic that the Greater Houston Amaryllis Club voted to make this their Number Two Civic Project and began preparations for the next year.

October 19, 1965 was set aside for the 1965 meeting. Each member of the Greater Houston Amaryllis Club furnished a blooming size Amaryllis bulb, clay pots were furnished by the Club, and Mrs. Charles H. Pease prepared the proper potting soil. The Lighthouse members were assisted (where necessary) to pot these bulbs by Mesdames Frank S. Bova, Jesse Haver, A. G. Horsfall, Glen Melton and Charles H. Pease. The Lighthouse members then took them home to care for before and after blooming. They received growing hints, as well as after blooming care suggestions with a great deal of interest.

The Lighthouse Club has monthly meetings, and we know every adjective in the book will be used when they describe to each other their little portion of BEAUTY FOR THE BLIND.

We hope this Number Two Project of our Club will be as rewarding to the Lighthouse Garden Club members as it is to our Club.

HERBERT MEDAL PRESENTED TO MR. BOSHOFF-MOSTERT

In a ceremony at the Kirstenbosch Gardens tea-room, Mr. Le Roux, Minister of Agricultural Technical Services, Republic of South Africa, presented the 1966 William Herbert Medal to Mr. Leon Boshoff-Mostert, February 3, 1966, on behalf of the American Plant Life Society. Among those present were the wife of the Prime Minister, and Mrs. Boshoff-Mostert. The reader is referred to the 1966 issue of the Amaryllis Year Book for the autobiography of Mr. Boshoff-Mostert.

Fig. 13. Mr. Le Roux presenting the 1966 William Herbert Medal to Mr. Leon Boshoff Mostert on behalf of the American Plant Life Society, Feb. 3, 1966. Photo Cape Times.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1966 Amaryllis Year Book (pages 39 and 40), the following numbered Amaryllis Judges Certificates have been issued by the American Amaryllis Society:

155. Mrs. H. Ward Blair, 5405 Cornish, Houston, Tex. 77007 (Horticulture only)
156. Mrs. R. C. Wille, 102 Cherrywood, Bellaire, Tex. 77401 (Horticulture and Arrangements)
157. Mrs. R. H. Haase, 2510 Watertown Mall, Houston, Tex. 77027 (Horticulture and Arrangements)
158. Mrs. Glen Melton, 1225 Archley Drive, Houston, Tex. 77055 (Horticulture only)

159. Mrs. C. L. Mercer, P. O. Box 56, Westfield, Tex. (Horticulture only)
160. Mrs. John Ellett, 7531 Satsuma, Houston, Tex. 77025 (Horticulture only)
161. Mrs. A. G. Horsfall, 110 Clifton, Houston, Tex. 77011 (Horticulture only)
162. Mrs. G. B. Slover, 3006 Castlewood, Houston, Tex. 77025 (Horticulture only)
163. Mrs. Samuel F. Johnson, 39 West Rivercrest Drive, Houston, Tex. 77042 (Horticulture only)
164. Mrs. Clyde Duplissey, 15105 Lakeview, Houston, Tex. 77040 (Horticulture only)
165. Mrs. R. F. Cox, Rt. 3, 1431 Sweet Gum, Humble, Tex. (Horticulture only)
166. Mrs. B. Carrel Tharp, 8218 Mallie Court, Houston, Tex. 77055 (Horticulture only)

PLANT LIFE LIBRARY—continued from page 4.

FLOWERS NATIVE TO THE DEEP SOUTH, by Caroline Dorman. Claitor's Book Store, 241 North St., P. O. Box 239, Baton Rouge, La. 70821. 2nd. ed. 1959. Pp. 176. Illus. $7.50: In this attractive book, including 33 color plates, and 102 text figures, Dr. Dorman has captured the delicacy and charm of native flowering plants of the Deep South. The text is clearly written for both the gardener and scientist. The illustrations by the author alone are worth much more than the price of the book, and it is most highly recommended to all gardeners.

NATIVES PREFERRED, by Caroline Dorman. Claitor's Book Store, 241 North St., P. O. Box 239, Baton Rouge, La. 70821. 1965. Pp. 217. Illus. $5.00. In this companion to her earlier book, Dr. Dorman explores the use of native trees and other plants "for every location". The subject matter includes rock gardens, bulb culture, the shady trail, herbaceous perennials, flowering trees, and shrubs, evergreens, vines, ground covers, pond culture, wild *Iris*, and growing wild flowers from seeds. Again, the fine text illustrations are by Dr. Dorman. Highly recommended to all gardeners.

A MONOGRAPH OF LEMNACEAE, by Edwin H. Daubs. University of Illinois Press, Urbana, Ill. 1965. Pp. 118. Illus. Cloth $4.50; paper, $3.50. This comprehensive monograph on the *Lemnaceae*, the first since the one by Hegelmaier (1868-1896), will be welcomed by all plant scientists. After considering the fossil record and chromosomes numbers, the lineagic treatment covers in detail the 28 species which are grouped under four genera. The keys, comparative tables of species for the four genera; the 21 plates, and bibliography, greatly enhance the value of the work. Highly recommended to all biologists.

BIBLIOGRAPHY OF MEXICAN FERNS, by George N. Jones. University of Illinois Press, Urbana, Ill. 1966. Pp. 297. $5.00. This bibliography of the principal literature to Mexican ferns will be welcomed by plant scientists. After listing the abbreviations of periodicals cited, the main part of the book is devoted to authors and titles to the published work. Then follow various finding indices, and geographical and systematic indices. A supplement, and indices of plant names and personal names, completes the work. Highly recommended to all plant scientists.

JAPANESE GARDEN AND FLORAL ART, by Mrs. Paul Kincaid. Hearthside Press, 381 Park Ave., S., New York, N. Y. 10016. 1966. Pp. 189. Illus. $6.95. This new book provides an introduction to Japanese aesthetics, flowers, gardens, Zeb and Tea Cult houses, bonkei, bonseki, bonsai, and ikebana. This attractive book is adequately illustrated and is highly recommended.

ADVANCES IN MORPHOGENESIS, VOL. 5. Edited by M. Abercrombie and Jean Brachet. Academic Press, 111 Fifth Av., New York, N. Y. 10003. 1966. Pp. 340.

$14.00. In this 5th Volume of the series, with contributions from six outstanding authorities, the subjects covered include feathers and patterns; the initiation of organized development in plants; the stimulus to hypertrophic growth; the ultrastructure of the cytoplasm of the developing amphibian egg; embryonic determination of neural connections; and the vitelline membrane and cortical particles in Sea Urchin eggs and their function in maturation and fertilization. Recommended to all biologists.

FUNDAMENTALS OF PHYTOMORPHOLOGY, by A. D. J. Meeuse. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1966. Pp. 231. Illus. $10.00. In this outstanding new book, Prof Meeuse presents a new outlook on the subject of plant morphology. He contrasts the old static morphology with a new evolutionary concept. Thus, for instance, he explores phylogeny with respect to the gymnosperms and angiosperms; and again, he discusses the phylogeny of the megasporangium with respect to the ovule and the carpellate pistil. This new approach promises to solve various difficult problems in phytomorphology. Prof. Meeuse is to be congratulated on a stimulating book—a land mark—and it is required reading for all plant scientists, students and professionals alike.

BOTANICAL LATIN, by Wm. Stearn. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. 1966. Pp. 566. Illus. $16.75. This represents the first complete guide and handbook to botanical Latin, an international technical language developed over the years for the naming and description of plants. The four parts of the book include an introductory section devoted mainly to the development of botanical Latin terminology, and the Latin alphabet and pronunciation; Latin grammar, syntax and other matters; and vocabulary and bibliography. Dr. Stearn is to be congratulated on an important contribution; a book which should be included in the library of all plant biologists.

JOHN TORREY, by Andrew D. Rogers III. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. 1965. Pp. 352. Illus. $7.50. This stimulating biography of John Torrey will be welcomed by all plant biologists. He was the mentor of the prominent North American plant lineagicists of his day, including Asa Gray. His activities represent the true beginning of plant lineagics in North America. He received and interpreted the plant materials gathered by the great expeditions of his time. His crowning achievement, in cooperation with Asa Gray, was the production of the first comprehensive North American work in plant lineagics. This is required reading for all plant biologists.

THE LIVING CYCADS, by C. J. Chamberlain. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. Facsimile reprint edition 1965. Pp. 172. Illus. $4.00. The classic 1919 original edition of Chamberlain's "The Living Cycads" has been long out of print, and it is a notable event when this was reprinted in 1965. In Part I, Chamberlain discusses the living western, Australian and African cycads; in Part II, he details the life-history of the cycads, and in part III, he considers the evolution and phylogeny of the cycads. Recommended to all plant biologists.

A MYCOLOGICAL ENGLISH-LATIN GLOSSARY, by Edith K. Cash. Hafner Publ. Co., 31 E. 10th St., New York 3, N. Y. 1965. Pp. 152. $8.50. This is Mycological Memoir No. 1, sponsored by the New York Botanical Garden and the Mycological Society of America. The extensive English-Latin glossary of mycological terms will be welcomed by mycologists as well as plant biologists in general.

PRINCIPLES OF ANGIOSPERM TAXONOMY, by P. H. Davis and V. H. Heywood. D. Van Nostrand Co., 120 Alexander St., Princeton, New Jersey. Revised ed. 1965. Pp. 558. Illus. $15.00. The authors consider lineagics as a science of synthesis, incorporating data from various disciplines such as cytology, genetics, embryology, and phytochemistry. The subject is developed under the subject headings, the roots of taxonomy; systematics after Darwin; units of classification; the concept of characters; taxonomic evidence; field, herbarium and library; presentation of data; modification of the phenotype; variation within populations; populations and the environment; evolution and the species; and hybridization and taxonomy. This stimulating book belongs in every lineagic library for constant reference.

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Fig. 14. Natural Arch at San Miserato Hill above Santiago de Chiquitos, Bolivia, the type locality of **Amaryllis starkii** Nelson & Traub. Photo by Martin Cardenas.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

BOLIVIAN SPECIES OF AMARYLLIS L.

MARTIN CARDENAS, *Bolivia*

Most of the known species of Amaryllis in the Andes thrive in humid shady locations. However the Bolivian species are found under rather variable ecological conditions. Most of them are found of course in the ecological formation called "Yungas" or the areas on the eastern slopes of the Andes covered by very humid forests ranging from about 1.200 to 1,800 m. to sea level. This formation is characterized by the predominance of tree ferns, *Ericaceae, Begoniaceae, Melastomataceae,* fuchsias, tall grasses and so on. Here belong the short tepaltubed, handsome flowered species, *Amaryllis pseudopardina* Card., (= *A. leopoldii* T. Moore), shown in Fig. 16; *Amaryllis yungacensis* Card. & Nelson, *Amaryllis forgetii* (Worsley) Traub & Uphof and *Amaryllis pardina* Hook. f. In this same ecological formation, grow in a semicultivated status, *Amaryllis vittata* var. *tweediana* and *Amaryllis belladonna* L. In a similar habitat but in a more open though still shaded places appear under bushes the most handsome bolivian Amaryllid, *Amaryllis Mandonii* (Baker) Traub & Uphof, near the village of Sorata at about 2,700 m. (see Fig. 15). The only two white and long-tepaltubed species growing in the Southern "Yungas" of Bolivia, are *Amaryllis fragrantissima* Card. (see added note, below); and *Amaryllis chionedyantha* Card. The very rare short-flowered species with a locality known by us only at second hand—*Amaryllis incachacana*, comes also from an upper "Yungas" habitat in the center of Bolivia.

Amaryllis reginae L. appears in semi-cultivated habitats, or under cultivation in the borders of the forests where probably there were settlers before the highways were built, on the "Yungas" formation at Yungas de Corani, and the present section of the highway near El Palmar at an elevation of 700 m. The plants seen by the late Prof. Nelson were under cultivation at Comarapa.

The second ecological habitat for the Bolivian Amaryllis is the mesothermic interandine high valleys at the center of the country ranging between the Departments of Cochabamba and Potosi from 2,000 to 3,000 m. high. Here are found the small flowered *Amaryllis mollevillquensis* Card., the scented white-flowered *Amaryllis umabisana* Card. and the most odd flowered species *Amaryllis cybister* (Herb.) Traub & Uphof. The two former taxa occur in a true xerophytic habitat under thorny bushes. The third one is strikingly ubiquitous since it appears at Comarapa east of Cochabamba at only 2,000 m. high, then at various localities near Cochabamba at about 2,500 m. and finally down at La Paz in the Hill Muela del Diable, over 3,600 m. Yet, *Amaryllis cybister* (Herb.) Traub & Uphof thrives in clayish hard soil, among rocks or in loose rich

soil with flowers which might be red-greenish or yellow-greenish (Fig. 17).

Fig. 15. **Amaryllis mandonii** (Bak.) Traub & Uphof. This represents the first published illustration of this species. Photo by Martin Cardenas.

The beautiful *Amaryllis evansiae* Traub & Nelson grows wild into the low, rather dry forests covering the low eastern foothills of the Andes, near the City of Santa Cruz.

Fig. 16. **Amaryllis pseudopardina** Cardenas (=**Amaryllis leopoldii** T. Moore), as it grows in its native habitat. Photo by Martin Cardenas.

A third habitat for *Amaryllis* in this country is centered in the low grassy lands of Mojos in the North and the Eastern savanna formations. At the Pampas de Mojos from outskirts of Reyes to the vicinity of Lake Rogoagua, grow one long-tepaltubed, white-flower species which was erroneously determined by Dr. H. H. Rusby as *Hippeastrum viridiflorus* Rusby. In our opinion this should be a new species. At the eastern savannas of the Provinces of Nuflo de Chavez, Velasco, Chiquitos and Chaco grow among grasses *Amaryllis divifrancisci* Card., and an undetermined variety of *Amaryllis belladonna* L. In the "pajonales" of southeastern Chaco are found *Amaryllis aglaiae* Castellanos and *Amaryllis parodii* (Hunz. & Coccu.) Traub. Dr. Th. Herzog has collected in the Bolivian Chaco two species which might be referred to *A. aglaiae* Castellanos and *A. parodi* although they were identified in 1910 as "*Hippeastrum brachyandrum* Baker" and "*H. solandriflorum* Herb." by Kranzlin. Among the very old sandstone rocks and growing in a rather loose soil, Prof. Nelson discovered the rare species *Amaryllis starkii* Nelson & Traub in the Province of Chiquitos (see Fig. 14).

A fourth habitat for our *Amaryllis* species, is in the upper Amazon basin areas. Here and still on the slopes of the Andean Mountains, appear *Amaryllis viridiflora* (Rusby) Traub & Uphof, *Amaryllis pardina* Hook, f., *Amaryllis belladonna* L. and *Amaryllis crociflora* (Rusby) Traub & Uphof. The species *Amaryllis pardina* Hook. f. which occurs in this area and about Apolo, Department of La Paz, seems to us the true species brought up to England by Pearce since the other type found in Yungas of La Paz, has on its tepalsegs blood red streaks instead of red dots. The type of *Amaryllis crociflora* (Rusby) Traub & Uphof which we have seen last year at the N. Y. Botanical Garden Herbarium is closely similar to *A. belladonna* L. whilst the one specimen we have collected at the type locality (Rio Guarutumo) in 1959 and given to the late Prof. Nelson, is different though we took it in 1960 before having seen the type, as *A. crociflora* (Rusby) Traub & Uphof. From the Bopi River regions and from Tipuani Mountains come various specimens collected years ago by B. A. Krukoff and G. H. Tate, actually at the N. Y. Botanical Garden Herbarium, determined as *Hippeastrum puniceum* Urb. or *H. Mandonii* Baker by E. J. A. and H. Rusby which however seem to us as new Amaryllis species. From the upper Rio Beni (Amazon Basin) was collected by M. A. Garriker Jr. what is now *Amaryllis belladonna* var. *Haywardii* (Traub & Uphof) Traub & Moldenke.

The Amaryllis species which grow in Yungas of La Paz, bear thick and succulent roots which might remain alive for several days. The bulbs of these are thriving on rather superficial very thin soil covering rocks. The species belonging to the mesothermic central valleys have medium thick roots and bulbs are entirely below the surface, and sometimes are deeply buried in a clayish soil. The roots of these bulbs may dry out in a few days. The thinnest roots are found in *A. starkii* Nelson & Traub since this grows in a loose quite pure sandy soil and consequently they dry out quite soon.

Fig. 17. **Amaryllis cybister** (Herb.) Traub & Uphof, **left**, the form with narrow tepalsegs which led Rusby to the erroneous conclusion that it was new, and the type of his "Lepidopharynx deflexa". **Right**, the form with wider tepalsegs. Photos by Martin Cardenas.

Fig. 18. The "type specimen" of the superfluous "Lepidopharynx deflexa Rusby". See also Fig. 16 for the form of **Amaryllis cybister** with narrow tepalsegs. Photo New York Botanical Garden.

We assume that in Bolivia one might expect *Amaryllis* species almost everywhere and that there still may be many yet to be discovered.

ADDED NOTE: THE TRUE LOCALITY FOR AMARYLLIS FRAGRANTISSIMA CARD.

In the 1960 Amaryllis Year Book, I described the species *Amaryllis fragrantissima* Card., based on a cultivated plant given me by a student of Agronomy as coming from Yungas de Corani, Province of Chapare, Dept. of Cochabamba. About March of this year (1966), my former assistant, Miss Ana M. Krueger while collecting plants for me near Tablas, happened to find several *Amaryllis* plants without flowers. The bulbs she brought back were planted here at the University, and one bulb is now in flower (October), and it is *Amaryllis fragrantissima* Card. It is native near the Village of Tablas at about 1,800 m. The locality given with the original description was Yungas de Corani, and Yungas de Tablas is next to this locality, and both are in the Province of Chapare. Like other *Amaryllis* species, this one is dichogamous with the anthers dehiscing pollen before the stigma becomes receptive. This insures that some of the progeny are cross-pollinated.

"GENUS LEPIDOPHARYNX" REDUCED TO SYNONYMY

MARTIN CARDENAS, *Bolivia*

The Genus *Lepidopharynx* in the Family Amaryllidaceae was proposed by the late Prof. Dr. Henry Hurd Rusby, Dean of the School of Pharmacy, Columbia University, and published in Memoirs of the New York Botanical Garden 7:205-387, 1 Mr 1927. Since that date the species *Lepidopharynx deflexa,* the only one included in that genus, was not collected again until November 1958 when Prof. Ira S. Nelson and myself collected it at the type locality (Fig. 17). These bulbs which turned up to be *Amaryllis cybister* (Herb.) Traub & Uphof. In 1965 at the beginning of September, I examined the type specimen of the *Lepidopharynx deflexa* Rusby at the New York Botanical Garden Herbarium and verified that it was *A. cybister* (Herb.) Traub & Uphof. The drawing illustrating the proposed genus *Lepidopharynx* does not agree well with the dry specimen in the details of the tepalseg habit. I am familiar with several forms of the very variable *A. cybister* and I am convinced that *Lepidopharynx deflexa* Rusby does not represent a valid taxon. Consequently the Genus *Lepidopharynx* must be reduced to the synonymy of *Amaryllis L.* Traub, in "The Genera of Amaryllidaceae" (1963) page 77 had indicated that the genus *Lepidopharynx* might have to be erased, and Traub (Plant Life 1966, p. 5) reduced the genus to the synonymy of *Amaryllis L.,* and the species to *A. cybister* (Herb.) Traub & Uphof. The type specimen of *Lepidopharynx* is shown in Fig. 18.

Universidad San Simon
de Cochabamba, Bolivia
June 20, 1966

Fig. 19. **Left,** Mrs. R. J. Seibert holding a bouquet of **Paramongaia weberbaueri** Velarde ("Cojomaria") flowers. **Right,** Mrs. Seibert purchases "Cojomaria" from Amerindian children, above Pariacoto, Huaraz, Casma Road, Dept. of Ancash, Peru, January 1965. Longwood Gardens. Photo by R. J. Seibert.

"COJOMARIA"—PARAMONGAIA WEBERBAUERI VELARDE, FROM PERU

RUSSELL J. SEIBERT, *Director,*
Longwood Gardens, Kennett Square, Penna.

To see a fine new ornamental plant is exciting to me. However, to find such a plant in its natural local habitat is a memorable experience and probably explains why, for the past 30 years of my graduate student and professional life, plant exploration has attracted me to other parts of the world. This attraction, like a compatible marriage, does not wane with maturity. It becomes even more magnetic.

Fig. 20. Habitat of "Cojomaria", **Paramongaia weberbaueri** Velarde, above Pariacoto, Huaraz-Casma Road, Dept. of Ancash, Peru. Longwood Gardens Photo (January 1965) by R. J. Seibert.

While returning from Huaráz and the Callejón de Huaylas to the Coast of Peru via the Huaráz-Casma Road on January 22, 1965, we were attracted by a sizeable bouquet of large yellow flowers being carried by a lone Andean Indian on horseback. The flowers, he said, were called "Cojomaria" and were found growing further down the road. A short drive and several high Andean switchbacks down, we encountered three children attending several bouquets of the same large, yellow amaryllidaceous flowers (Fig. 19). Obviously, the bouquets were for sale but since the children spoke no Spanish, our Quetcha proved insufficient to communicate well. We surmised that the plants grew

in an area further down the Andean slopes and that for a 5-Sole note, we could purchase a sizeable bundle of flowers. What remarkable blooms! At first sight, they remind one of giant daffodils, some 6 inches in diameter, butter yellow and very fragrant (Fig. 19).

Further down the Andes at somewhat less than 10,000 feet and along the steep slopes immediately above the village of Pariacoto, Department of Ancash (Fig. 20), we suddenly observed huge quantities of the flowering bulbous plants growing within a rather restricted area

Fig. 21. **Left,** young flowering plant of "Cojomaria", **Paramongaia weberbaueri** Velarde. Pariacoto, Peru. **Right,** cultivated **Paramongaia weberbaueri** Longwood Gardens #572124, Kennett Square, Penna., note offsets (see text). Longwood Gardens photos (January 1965) by R. J. Seibert

of perhaps less than 1000 acres. The soil appeared to be a decomposing granite. The natural vegetation was sparse scrub, almost chapparal-like. The plants were growing on extremely steep slopes which made their collection both difficult and precarious. With the aid of a car jack handle and digging to depths of 1 foot, entire plants, including the bulbs, were recovered (Fig. 20). The plants all appeared to bloom before the presence of mature foliage. None of the seven bulbs collected showed any evidence of off-sets. Two flowering bulbs were collected and

these were up to $2\frac{1}{2}$ inches in diameter. Of the 5 younger, pre-flowering bulbs collected, diameters ranged from $\frac{3}{4}$" to 1". The young foliage was exceptionally clean and fresh looking.

These flowers were kept for several days and a few lasted until returning to Lima 4 days later, at which time, some of the flowers and one of the flowering sized bulbs were presented to Dr. Ramon Ferreyra, Director, Muséo de Histórial Naturál "Javier Prado". It was not, however, until sometime later while discussing the plant with Dr. Jorge Leon, A.I.D. Botanist in Lima, that its identification was determined. The plant apparently is not well known outside its natural habitats of the Department of Ancash. According to Dr. Leon, it has been tried in Lima on at least one occasion, but with little success as a garden plant.

Six bulbs of flowering size were shipped to the Plant Inspection House in Miami, Florida, and in turn forwarded to the USDA Plant Introduction Station at Coconut Grove for continuing the growth cycle. When established, 5 pre-flowering size plants were forwarded to Longwood Gardens in mid-April 1965, where they are accessioned under our number 65522. The plants were dried off from May to August. In December, they renewed their growth without flowering.

Another accession of *Paramongaia weberbaueri*, Longwood Gardens #572124 (Traub #T-248) consists of four plants resulting from seeds distributed to us by Dr. Hamilton Traub in 1957. Two of the four plants produced their first flower this year, one from January 17-28; the other, February 7-15, 1966 (Fig. 21). Their origin, according to correspondence from Dr. Traub, traces to "Bulbs from Department of Ancash, Lomas de Lupin, between Huarmey and Barranca, 225 km, north of Lima, on the Pan American Highway, along the Coast." Possibly because of their first flowering, the flowers of both these plants average only slightly more than half the size of the flowers observed on the plants collected in the indigenous Pariacoto habitat. Young offsets are forming on each bulb of the Traub accession. None, however, were noted on the wild plants near Pariacoto. It will now be interesting to observe these two accessions growing together for future comparisons between plants of coastal origin and those of mountain origin.

NERINE NEWS NOTES

Emma D. Menninger

The Nerine Society has recently been organized in England "with hopes that it will be truly international." An attractive folder has been sent to me with a beautiful black and white photograph of Nerine 'Inchmery Kate' on the cover. The objects of the society as stated are:

1. To make the genus more widely known.
2. To discover and make known the best cultural techniques.
3. To establish a Register of names and descriptions in accordance with the International rules of nomenclature.
4. To encourage the improvement of the forms in cultivation.
5. To provide facilities for Members to exchange ideas, information and material. "It is proposed to publish a regular bulletin." The subscription is $2.00. Further information can be had from the secretary, Mr. C. A. Norris, Clent House, Clent, Worcestershire, England.

Mr. J. T. Gallagher, who contributed to Plant Life 1966, has a comprehensive paper on "Greenhouse Nerines" in the journal of the Royal Horticultural Society for May 1966. Besides describing the culture of Nerines in England, the article is enhansed by a page of Mr. Gallagher's beautiful colored photographs of the following clones: 'Mariloo' AM, RHS, 'Nena', 'Tancred', 'Eddy', 'Bagdad' and 'Highdown Orange'.

The June issue of the Journal of the Royal Horticultural Society has an article "Greenhouse Nerine Cultivation" by Mr. C. A. Norris, the Secretary of the new Nerine Society.

In last year's Plant Life, I wrote of my interest in pure white Nerines. From Mr. Gallagher, I learned of the giant snow white 'Vestal' at Exbury. I have been promised a bulb of this clone next year. Further reporting on my 24 seedlings from my white clone 'Crystal Palace' ♀ with pollen from other pure whites, there are as of the 1965 season: 5 unflowered, 4 pure white which I named 'Glacier', 'White Swan', 'Taj Mahal' and 'Cumulus'. The other 8 clones were tints of pink. Of the five unflowered clones, I hope to have at least one more pure white. One of the two seedlings from 'Star White' mentioned last year produced a white with some pink only in the bud—its name 'Carrara,'

A South African enthusiast of Nerines is Mr. Ken Douglas, Kingswood College, Grahamstown. He is preparing a monograph on Nerines. He has a comprehensive collection of Nerine species including a white variety of *N. undulata*. Being in the vicinity of the habitats of the various species of Nerines, Mr. Douglas' monograph should give much information on the ecological demands of these species including the many rare ones.

Mrs. Sima Eliovson of Johannesburg gave a fine illustrated lecture at the Los Angeles State and County Arboretum in Arcadia recently on the flora of South Africa. I asked her about the pure white *N. sarniensis*

from Table Mountain. She replied that it is very scarce and is not available in South Africa, but I might get it from England!

The tempo of *Nerine* interest has certainly increased this year and these beautiful flowers are getting the publicity they have so long deserved.

Greenoaks,
700 North Old Ranch Road,
Arcadia, California, 91006

NEW EUSTEPHIA SPECIES

Cesar Vargas, *Cuzco, Peru*

Until recently, only three species of *Eustephia* Cav. had been described. In 1954 and again in 1960, the present writer proposed new species, and also a variety of the original species was described in 1944.

(1) *Eustephia coccinea* Cav. (1790)
var. *coccinea*
var. *multiflora* Vargas (1944)
(2) *Eustephia pamiana* Stapf (1929)
(3) *Eustephia armifera* Macbride (1951)
(4) *Eustephia longibracctata* Vargas (1954)
(5) *Eustephia darwinii* Vargas (1960)

Eustephia var *coccinea* is widely distributed in Peru, and grows at altitudes of 3000 to 3600 m., but the variety *multiflora* is known up to the present only from one locality around the town of Lares, Calca, Cuzco, alt. 3200 m. The Latin and Spanish descriptions may be read in "De Nobis Especiebus Florae Peruvianae", in Bo. Hist. Nat. "Javier Prado", vol. VIII, nr. 30-31, page 215. 1944, Lima, Peru; holotype CVC 3586. The English description follows:

The *bulbs* of the variety are larger than those of the original species, and there is a well-developed *bulb-neck*, the *plant* is more robust, including the *scape*, which is longer and thicker, purple, and angular; the *spathe-valves* are purple, and longer and wider; the *umbel* is about 8—10-flowered; the *pedicels* are 6.5 cm. long; the *perigone* is shorter, purple; the *setepalsegs* are provided with a longer claw at the apex, and the *teeth* on the *stamen-filaments* are shorter and wider.

Eustephia longibracteata Vargas (1954), in Rev. Univ. Cuzo, nr. 107, 2nd semester, page 152, fig. 1. 1954. This species is endemic to the Ollochea Valley, Puno, Peru, and it is closely related to *Eustephia armifera* Macbride (1951), but differs in the following characters: *Bulbs* oblong, robust, *bulb-neck* long, 12—15 cm. long; the *scape* is robust, angular, 26 cm. long, and 10 mm. in diam.; *spathe-valves* are longer than the flowers, purple; *pedicels* 2.6 cm. long (in *E. armifera* they are only 1.5 cm. long), the *tepalsegs* are purple, shorter and wider, the *setepalsegs* shorter; the *stamen-filaments* are wider, and the *teeth* are wider and curved, acute (quite different from those of *E. armifera* Macbride). This description was made from living specimens.

Eustephia darwinii Vargas (Bol. Fac. Cien. Univ. Nac. Cuzco, nr. 1, page 7, fig. 3, 1960). The following description was made from living material which is under cultivation at Cuzco. The *bulb* is oblong, 7 cm. long, 4 cm. in diam., *bulb-neck* 15 cm. long, 2.3 cm. in diam.; *leaves* lorate, 9—12, appearing after the flowers, 123 cm. long, 3 cm. wide; *scape* robust, angular, 45 cm. long, 1.8 cm. in diam., red, *spathe-valves* 6 cm. long, 1.2—1.4 cm. wide at the base, somewhat triangular; *umbel* 5—9-flowered; *pedicels* 3—4.2 cm. long, red; *setepalsegs* red, green tipped, short-spatulate, 4.5—5 cm. long; *petepalsegs* as long as the setepalsegs, but wider, pink, whitish and green and yellow at the apex; *stamens* somewhat exserted; the *stamen-filaments* winged and the teeth 4 mm. long; *stigma* slightly lobulate. This species is quite different from the others.

REPORT ON "EUSTEPHIA JUJUYENSIS"

Hamilton P. Traub

For a number of years attempts have been made to trace down the name, "Eustephia jujuyensis", given to a plant collected by Harry Blossfeld of Sao Paula, Brasil. Under date of November 16, 1965, Mr. Blossfeld reported:

"The only thing I can inform you about "Eustephia jujuyensis" is that I gathered a number of samples in 1935 in northern Argentina and sent live material of all of these to Messrs. Van Tubergen of Haarlem, Holland; botanical samples also were sent to the Dahlem Botanical Garden, where I was a student at the time. Among this material was *Amaryllis immaculata* and "Eustephia jujuyensis." The species name of the latter points to its origin, the Province of Jujuy, where I gathered both of the above mentioned plants. I do not remember, nor can I now trace who gave me these identifications, Dahlem or Van Tubergen. The herbarium specimens I obtained then—about 1,000 sheets of dried plants from Argentina—the whole lot was lost when our truck stuck in the water of the Rio Branco near Salta; the lighter weight part of our luggage was immediately swept away by the current."

The writer has a bulb of what is reported to be "Eustephia jujuyensis" growing in his garden, and hopes to report a detailed description in PLANT LIFE when it flowers. Two other species of *Eustephia*, *E. coccinea Cav.*, and *E. darwinii* Vargas, thrive in his garden, blooming two or three times each year. However, they all set no seeds, and this has retarded the wider distribution of these choice amaryllids. They are especially recommended for outdoor culture in California, and similar climates.

NOTHOSCORDUM FELIPPONEI BEAUV. ITS STATUS AND CHROMOSOMES

Pedro Félix Ravenna

Owing to the fact that the present species has been transferred successively to several genera, it appears desirable to give a description and a brief discussion of its nomenclature. In addition, its chromosomes are here reported for the first time.

STATUS OF NOTHOSCORDUM FELIPPONEI

Nothoscordum felipponei Beauverd, Bull. Soc. Bot. Geneve, ser. II, 13 : 267. 1921. *Triteleia sellowiana* Kunth, Enum. Pl. 4 : 466. 1843; *Milla sellowiana* (Kunth) Baker, Journ. Linn. Soc. Bot. 11 : 383. 1871; *Brodiaea sellowiana* (Kunth) Baker, Garden Chron. ser. III. 20 : 459. 1896; *Brodiaea felipponei* (Beauv.) Herter, Flora Urug. 2 : 47. 1930; *Beauverdia felipponei* (Beauv.) Herter, Boissiera 7 : 510. 1943; *Beauverdia sellowiana* (Kunth) Herter, loc. cit.; *Ipheion felipponei* (Beauv.) Traub, Pl. Life. 11 : 128. 1955; *Tristagna felipponei* (Beauv.) Traub, Pl. Life 19 : 61. 1963; *Tristagma sellowianum* (Kunth) Traub, loc. cit.-Excl. syn.: *Nothoscordum ostenii* Beauverd, Boissiera, ser. II, 8 :996, fig. 1-J-M. 1908 (a different species).

Plant 25-80 mm. high. *Bulb* almost ovoid covered with ochraceous coats, with a short neck, about 12-16 mm. long, 10-13 mm. in diam. *Leaves* crowded, spreading, entirely glabrous, often firm in texture, dark green, oblong-lanceolate or linear, canaliculate but not carinate, becoming narrower at the apex, about 3-8 cm. long and 2-7 mm. wide. *Scapes* often several to each bulb, becoming decumbent from their base after flowering, about 2-5 cm. long. *Spathe* bivalved, valves brownish, membranaceous, ovate-lanceolate, about 11-13 mm. long, 3,5-7 mm. in. wide, united at their base for 3,5-4 mm. of their length. *Umbel* 1-flowered, flowers yellow, often very large, about 18-32 mm. in diameter. *Pedicels* about 2.8-6 mm. long. *Tepalsegs* oblanceolate, subequal, united at the base for 1.4 mm, ascending for 4-7 mm., then spreading, about 14-22 mm. long, 5-7 mm wide. often acute, outer tinged with brownish-red in the outside. *Filaments* subequal, erect, somewhat flattened, becoming narrow at the apex, about 5.5-7 mm. long attached at the same level at the base of the tepalsegs. *Anthers* versatile, oblong, yellow, about 2-2.2 mm. long. *Ovary* ovoid or oblong-ovoid, green, about 4.3-5.5 mm. long, 2-2.7 mm. in diam. *Style* elongated nearly 5.5 mm. long or sometimes less; *stigma* capitate, obscurely bilobed or trilobed. Chromosomes 2n=10.

Exsiccatae.-Uruguay, Montevideo, Cuchilla Pereyra; leg. *F. Felippone* 3493 (isetypus SI). Montevideo; leg. *F. Felippone* 3471 (SI). Without locality; leg. *F. Felippone* 5763 & 6029 (SI). Montevideo, Cerro; leg. *Herter* 434 (80842), apr. 1926 (SI). Brasilia meridionalis; leg. *Sello* s/n (phototypus ex K).

Despite the locality data (probably incorrect) of the Sello's material, this beautiful species seems to be endemic to the rocky hills of central and

southern Uruguay. It was originally classified as *Triteleia sellowiana* by Kunth, but this was never recognized as a *Nothoscordum*. In the same work this author gave a description of another species, calling it *Nothoscordum sellowianum* Kunth. Owing to this fact, the name *sellowianum* cannot be used for our plant. Incidentally, Beauverd described *Nothoscordum felipponci* as a new species. Later, after having been transferred by Baker (1871, 1896) to another genus, it was included by Herter (as both *N. felipponci* and *Triteleia sellowiana*) in *Beauverdia*. This genus was untenable because it was a mixture of discordant elements: some of the species belonged to *Nothoscordum* and the rest to *Tristagma*. Lately, *N. felipponci* was transferred by Traub (1959), with the rest of the species of *Beauverdia* to *Ipheion*, and, recently, when the latter was interpreted as a synonym of *Tristagma*, to this genus (1963). Actually Beauverd's interpretation of *Nothoscordum* was correct. With mostly free tepals, filaments subequal and a clearly visible ovary, our species must be considered as a genuine *Nothoscordum*.

In order to assist in distinguishing *Nothoscordum* from *Tristagma*, the following key is presented:

1a. Tepals more or less united in a tube or narrow cup which conceals the ovary. Filaments very dissimilar in length, attached at different levels often inside the tepal tube ..... *Tristagma*

1b. Tepals more or less united at the base, often forming a funnel which does not conceal the ovary. Filaments often subequal, attached almost at the same level at the throat of the tepal tube ..... *Nothoscordum*

NOTHOSCORDUM SPECIES RESTORED

The following listed taxa, which were included or transferred to *Beauverdia*, *Ipheion* and *Tristagma*, are *Nothoscordum* species:

Nothoscordum lorentzii (Hert.) comb. nov.—Syn.-*Beauverdia lorentzii* Herter, Boissiera 7:509. 1943; *Ipheion lorentzii* (Hert.) Traub, Pl. Life 5:50. 1949; *Tristagma lorentzii* (Hert.) Traub, Pl. Life 19:61. 1963.

The present, an amazing almost always tetramerous species, I select as the type-species of *Beauverdia* Hert.

Nothoscordum hirtellum (Kunth) Herter, Ind. Sem. Montev. 1928-29.—Syn.-*Triteleia hirtella* Kunth, Enum. Pl. 4:465. 1843; *Milla hirtella* (Kunth) Baker, Journ. Linn. Soc. Bot. 11:385. 1871; *Brodiaea hirtella* (Kunth) Baker, Gard. Chron. ser. III, 20:459. 1896; *Nothoscordum canescens* Beauverd, Bull. Herb. Boiss. ser. II, 8:997, fig. 1-A-D. 1908; *Beauverdia hirtella* (Kunth) Herter, Boissiera 7:509. 1943; *Ipheion hirtellum* (Kunth) Traub, Pl. Life 5:50. 1949; *Tristagma hirtellum* (Kunth) Traub, Pl. Life 19:61. 1963.

Nothoscordum lloydiiflorum Beauverd, Bull. Herb. Boiss. ser. II, 8:998, fig. 2 1908.—Syn.-*Beauverdia lloydiiflora* (Beauv.) Herter, Boissiera 7:510. 1943; *Ipheion lloydiiflorum* (Beauv.) Traub, Pl. Life 5:50. 1949; *Tristagma lloydiiflorum* (Beauv.) Traub, Pl. Life 19:61. 1963.

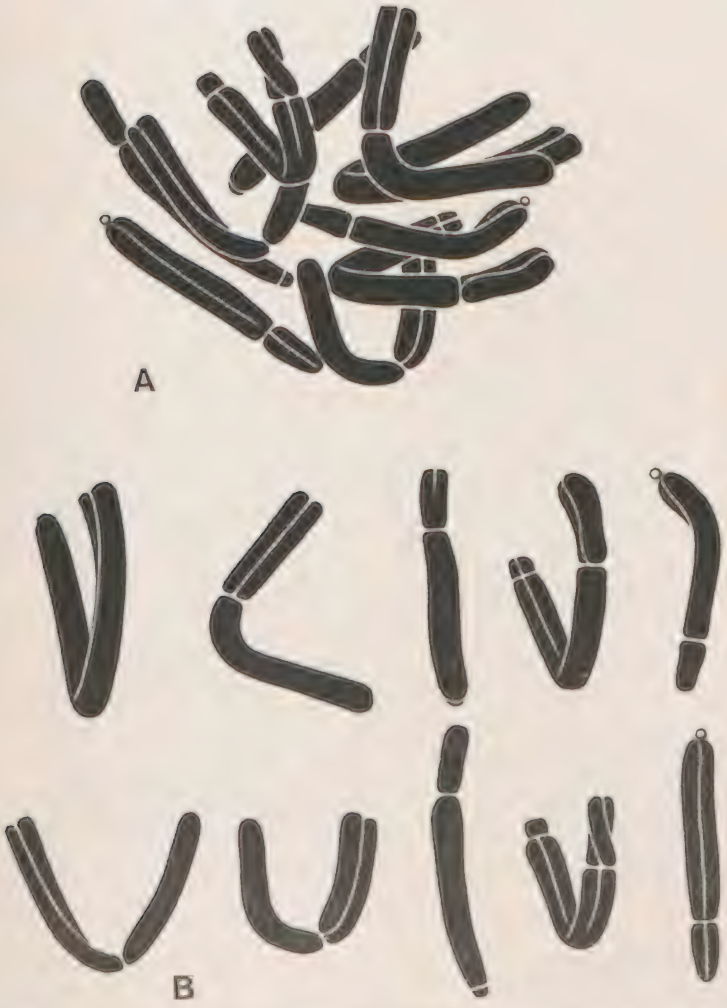

Fig. 22. The chromosomes of **Nothoscordum felipponci** Beauv. Drawing made with a camera-lucida at a table magnification of approx. X2300, and reduced approx. by 22% in reproduction.

CARYOLOGY

This work was carried out in the Genetics II Laboratory, Faculty of Sciences, University of Buenos Aires.

The previously reported chromosome numbers in *Nothoscordum* Kunth, are indicated in Table 1.

Table 1. Chromosome numbers reported in **Nothoscordum** Kunth, up to 1966. x=8, 9 (triploids apomiptic).

Species	2n	Authority
bivalve (as **striatum**)	16	Levan, Hereditas 20: 289. 1935
	18	Beal, Bot. Gaz. 93: 278. 1932
bivalve	18	Messeri, Nuovo G. bot. ital. 38: 409. 1931
inodorum (as **fragrans**)	16, 24/3	Levan, Hereditas, 20: 289. 1935
	18	Levan, Amer. J. Bot. 31: 161. 1944
	16, 22	Garber, Caryologia 1: 291. 1949
	19	D'Amato, Caryologia 1: 57. 1942
neriniflorum	16, 17	Sato, Jap. J. Bot. 12: 57. 1942

MATERIALS AND METHODS

Bulbs of *Nothoscordum felipponci* were collected in 1958 at Verdun, Mina Dept., Uruguay. They were cultivated in my private collection where they flowered each year.

Toot-tips were pre-treated in saturated aqueous solution of para-dichlorobenzene for nearly four hours, fixed in Carnoy 3:1 for 48 hours, washed in distilled water, hydrolyzed in 2 normal hydrochloric acid, and stained in acetic-orein solution. The drawing was made with a camera-lucida at a table magnification of approximately X2300, and reduced by about 22% in reproduction (see Fig. 22). Preparations were made permanent by removal of the cover slips, smearing cover slips with Mayer's albumen, dehydrating both slides and cover slips, and mounting in Euparal.

As shown in Fig. 22, the diploid chromosome number of *Nothoscordum felipponci* is 2n=10, a number not previously reported in this genus.

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HYMENOCALLIS AZTECIANA, SP. NOV.

HAMILTON P. TRAUB

In 1966 Mr. Horace Anderson of Leucadia, Calif., presented two potted plants of a *Hymenocallis species* which had been collected by his friend Sra. Jacoba Garcia de Frias near the small ranches of Cabos and Batio about three hours' walk from the City of Jalpa, in the State of Jalisco. One was a flowering size bulb, and the other a smaller seedling. When the larger plant flowered in June, 1966, it was at once apparent that it was new to science. It had a prominent, thick pseudo-stem produced by the sheathing of the leaves below. While annotating the *Hymenocallis* specimens from the Missouri Botanical Garden Herbarium at about the same time, it was noted that D. P. Gregory & G. Eiten no.

254 (MO 1744709), "State of Jalisco. Cerro Viego, south face, above Zapotitan de Hidalgo, a village about 1 mi. n. of Highway Mex. 15; about 25 mi. due s., or 45 road mi. from Guadalajara. Shaded woods, rich black loam, alt. approx. 2300. Tepalsegs narrow, white, carnation odor. June 28, 1956", is identical with the plants obtained from Mr. Anderson. This served as verification of the species.

Since the ancient inhabitants of Mexico have been relatively neglected in the naming of plants, the new species has been named for the Aztec Amerindians, *Hymenocallis azteciana*. The plant is easily cultivated in a rich loamy soil mixture, and in at least half shade.

Fig. 23. **Hymenocallis azteciana** Traub, from the State of Jalisco, Mexico.

Hymenocallis azteciana Traub, *sp. nov.*

Foliis liberis 5 anguste ellipticis deorsum vaginatis, pseudocaulem validum tubulosum 11.5 cm. longum 2—3 cm. latum conficientibus; scapo usque ad 63 cm. lato; umbella 9-flora; floribus albis viridibusque; ovulis per loculam 5; tubo tepalorum usque ad 6.4 cm. longo; segmentis tepalorum gracilibus 10.5—11.3 cm. longis; cupula staminali 2.7 cm. longa; filamentis 4.5 cm. longis; antheris versatilibus; polline auranteo; stigmate capitato.

Bulb globose, 5.5 cm. long, 4 cm. in diam., bulb-neck 4 cm. long, 2.2 cm. in diam. Free sessile *leaves* 5, narrowly-elliptic, 7.5—9.3 cm. long, acuminate, 2.9 cm. wide at the base, up to 8.3 cm. wide at the middle;

green above, mid-rib lighter green, prominently keeled whitish to light greenish, and glaucescent on the under side at first, later turning green; sheathing below, forming a thick pseudo-stem, 8—11.5 cm. long, 2.1x3.1 cm. in diam., somewhat flattened, with roundish edges, deep green reticulations on lighter whitish-greenish background. *Scape* up to 63 cm. long, 1.3x1.7 cm. in diam. (base), 1x1.3 cm. in diam. (apex), medium green, flattish, with rounded edges, solid. *Spathe-valves* 2, lanceolate, 9.5—10 cm. long, 3 cm. wide and overlapping at the base, acute or bluntly acute; 2 bracteoles relatively wide, the remainder smaller; green at first, changing to brown on drying. *Umbel* 9-flowered; flowers first opening in the evening, white, except ¼ of tepaltube green, upper ¾ of filaments and style, green; tepalsegs spreading, florets straight in bud, tepaltube curved in lower ⅓ on flowering; delightfully perfumed. *Ovary* sessile in the umbel, oblong, 1.3 cm. long, 6 mm. in diam.; ovules 5 per locule. *Tepaltube* 6.3—6.4 cm. long, 5 mm. in diam. (base), 8 mm. in diam. (apex). *Tepalsegs* linear acute; setsegs 11.3 cm. long, 5 mm. wide; petsegs 10.5 cm. long, 6.5 mm. wide. *Staminal cup* 2.7 cm. long, narrowly funnel-shaped, including the tubular base (1.2 cm. long); *filaments* 4.5 cm. long; *anthers* 2.4 cm. long, attached toward one end below the middle, versatile, pollen orange-colored. *Style* overtopping the stamens; stigma capitate.

Holotype: Traub No. 1031a+b+c (TRA), 6-8-66, grown from bulb collected by Sra. Jacoba Garcia de Frias about three hours' walk from the City of Jalpa, State of Jalisco, Mexico. *Paratype:* D. P. Gregory & G. Eiten No. 254 (MO 1744709), State of Jalisco, Cerro Viego, south face, above Zapotitan de Hidalgo, about 1 mi. n. of Highway Mex. 15., June 28, 1956.

SPREKELIA CHROMOSOMES

W. S. Flory and S. Bose,

Wake Forest College and University of Calcutta

During the past 30 years several persons have reported chromosome numbers for the Mexican monotypic *Sprekelia formosissima*. These numbers have varied somewhat, but have been high in each case. Somatic chromosome numbers of approximately 110 were reported by Inariyama (1937), of from 110 to 117 by Sato (1938), of about 121 by Snoad (1952), and of 116 by Mookerjea (1955).

Several tentative counts, on commercial bulbs of *Sprekelia*, were made, some 15 years ago, with approximately 120 chromosomes being found at somatic metaphase. In October, 1952, a number of bulbs of this species were collected in a barranca just west of Cuernavaca, and these were found to each have 60 somatic chromosomes. When these Cuernavaca bulbs matured they produced flowers with narrower perianth segments than the flowers from commercial bulbs. Shortly thereafter, a more detailed analysis of *Sprekelia* chromosomes was started.

Thirty-two plants were selected for these studies. Six were from commercial sources, with the type flower most frequently observed. Five

with narrower-segmented flowers were from near Cuernavaca. Twenty-one bulbs were selected, from a large supply furnished by Dr. T. W. Whitaker; these particular selections produced flowers with a larger, wider-segmented appearance.

Details of the study have been described in several recent reports (Bose and Flory, 1965; Flory and Bose, 1966). The present summary is provided for the readers of Plant Life at the request of its editor.

As indicated above, the plants from Cuernavaca each had 60 somatic chromosomes. These ranged from 5 to 12 microns in length, following a pretreatment of the root tips for 4 to 6 hours in .2% colchicine. These 60 chromosomes could be divided into 4 types, designated A (2), B (12), C (44) and D (2). The A pair of chromosomes was the longest, and had near-median centromeres. The B chromosomes were the shortest, with 4 of these (B_1) being about 2.7 microns long and having near-median centromeres, while 8 (B_2) averaged 4.2 microns in length and had submedian constrictions. The C chromosomes all had subterminal centromeres, and varied from 5 to just over 8 microns in length. The C chromosomes could be divided into 6 subtypes (C_1, C_2, C_3, C_4, C_5 and C_6) on the basis of different lengths and variation in centromere positions. The two D chromosomes had subterminal centromeres, and averaged 5 microns in length—excluding the satellite subtended by each.

In 6 commercial bulbs with usual flower types the 2n chromosome number was about 120. From 12 cells in which unquestioned counts were recorded the following 2n numbers (with number of times) were observed: 117 (1), 118 (3), 120 (2), 122 (1), 123 (3), 124 (1) and 127 (1).

Of 21 bulbs producing apparently larger flowers, one was 2n=ca. 150; in 20, 2n=ca. 180. Unquestioned counts in 7 cells of the plant with about 150 chromosomes showed the following 2n numbers (with number of times observed): 144 (1), 148 (2), 150 (2), 151 (1), 154 (1). Unquestioned counts in root tip cells of plants with about 180 chromosomes (with number of times observed) were: 164 (1), 165 (2), 167 (2), 169 (2), 172 (4), and 178 (2). It has been determined that the same major types of chromosomes are present in the 2n= about 120, 150 or 180 plants, as in the 2n=60 plants from Cuernavaca, and in the same proportions. This is also true of the subtypes of chromosomes B and C.

It is likely that increase in chromosomes to the high numbers encountered here would in itself decrease mitotic efficiency because of crowding, or some other disturbance of nuclear balance. This could plausibly account for higher than expected numbers of chromosomes entering some cells, with lesser numbers going to sister cells. It could explain the number of cells with more or less than 120, 150, or 180 chromosomes in the *Sprekelia* euploid series. Such chromosome crowding caused by increase of chromosome number was suggested by Menzel and Brown (1952) as a probable cause for the varying chromosome numbers associated with mosaic formation in their hexaploid (2n=78) *Gossypium* hybrids. With considerably higher numbers of chromosomes, in most of our *Sprekelia* accessions, such crowding would here

seem an even more likely cause of uneven division resulting in cells with aneuploid numbers.

BASIC CHROMOSOME NUMBER IN **SPREKELIA**

With a euploid series of 60, ca. 120, ca. 150, and ca. 180 chromosomes being known, a base number of 30 chromosomes for Sprekelia occurs, of course, as a strong possibility. If this is the case, then taxa which are essentially diploid, tetraploid, pentaploid and hexaploid have been dealt with. Actually, in counts with races having more than 60 chromosomes, cells which are aneuploid deviates are more frequent than are those with exact multiples of 30 chromosomes. The numbers of each different type of chromosome observed would seem to substantiate the reasoning that 30 is a base number; only 2 chromosomes of type A, 2 chromosomes of type D, and 4 chromosomes of type B_1, have been observed with $2n=60$, with similar representation of these types in the races with higher numbers.

It is conceivable, and perhaps more logical, to think that a basic number of $n=30$ was derived, at least, from a lower base number. The most recent arrangement of the genera of Amaryllidaceae (Traub, 1963) places *Sprekelia* in tribe Zephyrantheae. In this tribe *Habranthus*, *Cooperia*, *Zephyranthes*, and perhaps other genera, quite obviously have 6 as a basic chromosome number (Flory, 1958). It seems reasonable to suspect that the basic chromosome number in *Sprekelia* also is 6, rather than 30. If 6 is the base number in *Sprekelia*, it would mean that in the process of karyotype evolution, translocations, or other cytological changes have occurred, since the chromosome types now encountered in *Sprekelia* are not present in the proper numbers to satisfy this conception, otherwise. It is of probable significance that *Sprekelia* occurs in geographical areas where *Zephyranthes* is represented by a number of species, and where *Cooperia* and *Habranthus* are also prevalent.

Data has also been secured on perianth segment length and width, and on certain other flower and inflorescence characters, where $2n=60$, ca. 120 and ca. 180. A positive correlation is apparent between flower size and chromosome number.

SUMMARY

It has been found that an approximate euploid series of 60, about 120 (118 to 124), about 150 (148 to 155) and about 180 (164 to 178) occurs in *Sprekelia*. The chromosomes are comparatively large, furnishing a total chromatin mass suggested to cause crowding resulting in mitotic irregularities and frequent aneuploidy, especially where numbers are in excess of 100.

In general, the higher chromosome plants produce the largest flowers, with a positive correlation between flower size and chromosome number. Selection for commercial flower types in *Sprekelia* has quite apparently been accompanied by the unconscious selection of plants with increased chromosome number.

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AMARYLLIS ARGILAGAE SP. NOV.

Hamilton P. Traub

In the 1966 issue of Plant Life (pages 41—42), Dr. Joseph C. Smith gave a general description of an *Amaryllis* species collected by Dr. C. G. Ruppel on the banks of the Uruguay River in the Province of Cor-

Fig. 24. **Amaryllis argilagae** Traub, the new dwarf **Amaryllis** of the Striata Alliance. Photo by Dr. C. G. Ruppel.

rientes, Argentina. This plant flowered for Dr. Joseph C. Smith in 1965 when the holotype was prepared. This species was also collected by the United States Crops Exploration Division. Plants were sent to

Fig. 25. **Amaryllis argilagae** Traub, after a pencil drawing by Prof. Penrith Goff.

Dr. Thomas W. Whitaker who flowered it in 1966.

At the request of Dr. C. G. Ruppel, the species is named in honor of his good friend, Mr. Paul Argilaga.

Prof. Penrith B. Goff, of the University of Kentucky, made a pencil drawing of the species from a color slide furnished by Dr. C. G. Ruppel. This is reproduced in Fig. 25.

Amaryllis argilagae Traub, sp. nov.

A. striato affinis sed minor; bulbo parvo 3.3 cm. longo 2.7 cm. diametro bulbosis numerosis gerenti, prope basin squamato; folis usque ad 7 oblanceolatis; umbella 4-flora; floribus cinnabarinis, tepalis 6.5—7 cm. longis initio regularibus demum gradatim aliquantum irregularibus, tubo tepalorum 1.5 cm. longo.

Bulb small, pear-shaped, 3.3 cm. long, 2.7 cm. in diam., neck very short (8 mm. long); plant is related to *Amaryllis striata*, and like it produces numerous bulblets. *Leaves* up to 7, more or less evergreen, usually 18-22 cm. long, (up to 38 cm. long under cultivation in very rich soil), oblanceolate, 1.3 (—1.7 in well-fertilized plants) cm. wide (base), 2.3—2.6 (—3.6 in well fertilized soil), cm. wide above the middle, bluntly acute, deep green. *Scape* up to 17 cm. long, slightly compressed, with round edges, 8x10 mm. in diam. (base), 5x8 mm. in diam. (apex), dull green, reddish near the base. *Spathe-valves* 2, lanceolate, tinged reddish, 4.2—4.5 cm. long, apex acute. *Umbel* 4-flowered, flowers held more or less horizontally, at first tepal-segs are regular, gradually changing to somewhat irregular; the upper setseg and 2 side setsegs reflexed, 2 side petsegs twisted in upper 1/3, color vermilion (HCC 18/1), white band in center of segs about 2/3 up, except band very narrow and only ¼ up in lower petseg; filaments and style vermilion. *Pedicels* 0.6—0.8—1.7—2.2 cm. long at anthesis. *Ovary* 8 mm. long, 5 mm. in diam., green. *Tepaltube* 1.5 cm. long. *Tepalsegs*: *setsegs*: upper, 6.9 cm. long, 2.2 cm. wide, oblanceolate, acute; 2 side setsegs, 7 cm. long, 1.6 cm. wide, narrowly oblanceolate, bluntly acute; *petsegs*: 2 side, 6.5 cm. long, 2 cm wide, oblanceolate, falcate, acute; bottom petseg 5.7 cm. long, 0.7 cm. wide, very narrowly lanceolate, acute. *Paraperigone* apparently absent. *Stamens* about 2/3 as long as the segs, attached slightly below the apex of the tepal-tube. *Style* shorter than the segs, and slightly longer than the longest stamens; anthers 4 mm. long, oblong, pollen creamy-white; stigma trifid, lobes 2 mm. long.

Holotype: Joseph C. Smith s.n. (= TRA 1014), cult. La Mesa, Calif., 10-28-65, from bulbs collected by Dr. C. G. Ruppel, Uruguay River, Santo Tomé, Corrientes, Argentina. Paratypes: #768 TRA, USDA P. I. 202235, Rio Grande do Sul, Brasil, 3-11-60; and #1028 TRA, La Jolla, Calif. 6-1-66, 6-1-66.

Notes.—This is the species discussed by Dr. Joseph C. Smith in the 1966 PLANT LIFE, page 44. It is particularly valuable to the breeder interested in miniature hybrid Amaryllis. We are grateful to Dr. C. G. Ruppel who first sent this plant to us from Argentina. The species has been named in honor of Dr. Ruppel's good friend, Paul Argilaga, of Santo Tomé, Corrientes.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Schoenoprasum lineare H.B.K., Nov. Gen. et Sp. 1: 277. 1816 leaves linear, flat, glabrous, shorter than the striate terete scape; umbels many-flowered. It grows in the mountains of New Spain between Santa Cruz de la Sierra and Mount El Gigante, at 7800 feet altitude. It blooms in September. Bulb ovate, the size of a cherry, with numerous fibers at

the base; leaves narrowly linear, flat, striate, glabrous, very thinly membranous at the base, sheathing, 4 inches long; scape erect, terete, striate, glabrous, 5 or 6 inches long; umbels 12- or 15-flowered; flowers pedicellate; pedicels terete, glabrous, 14—18mm. long; spathe ovate-lanceolate, withered, striate, glabrous, half as long as the pedicels, reflexed; calyx-segments oblong, rather acute, patulous, whitish, with a median red longitudinal line; stamens as long as the calyx; filaments glabrous, subulate; anthers oblong; pollen gray; ovary ovate, trigonous; style subequaling the stamens.

Schoenoprasum longifolium H.B.K., Nov. Gen. et Sp. 1: 277. 1816 leaves linear, flat, glabrous, surpassing the terete striate scape; umbels sub-8-flowered. It grows near Queretaro, Aroyozarco, and San Juan del Rio, Mexico, at an altitude of 6090 feet. It blooms in August. Bulb subglobose, the size of a large cherry, tunicate, with numerous fibers at the base; leaves narrowly linear, flat, obtuse, striate, glabrous, conspicuously dilated and very thinly membranous at the base, 8 or 9 inches long, 2 mm. wide; scape erect, terete, striate, glabrous, 6 inches long; umbels sub-8-flowered; flowers pedicellate; pedicels subequal, glabrous, patulous, an inch long during anthesis, an inch and a half long when in fruit; spathe bifid, reflexed, the segments ovate-lanceolate, acuminate, striate, withered, glabrous half an inch long; calyx segments lanceolate; stamens shorter than the calyx; filaments subulate; capsule oblong the size of a small pea; seeds angulate, black.

Haemanthus canaliculatus M. R. Levyns, J. S. Afr. Bot. 32: 73-75, pl. 1. 1966 bulbous very smooth herb; bulb about 9 cm. in diameter, the tunic divided into 2 parts; leaves 2 or sometimes 3, hysteranthous, narrowly linear, involute at the margins, channeled, almost 36 cm. long; peduncle thick, rosy; bracts lanceolate, slightly acute (we would say subacute— HNM), reddish, patent; flowers numerous, crowded, reddish; perianth tube about 5 mm. long, the lobes about 29 mm. long; berry globose; seed ovoid, chestnut-colored, shiny. Betty's Bay and Rooi Els, western Cape Province.

Allium tubiflorum Rendle, J. Bot. Lond. xliv: 44-45, pl. 476, figs. C, 8—11. 1906 plants glabrous, a foot tall or smaller; bulb ovate to subglobose, solitary, the tunic whitish, scarious, entire; stem erect, subcompressed, rather roughly striate-angulate, leafy at the base, slightly surpassing the narrowly linear leaves; spathe 1-valved, laterally split, shortly acuminate, about half as long as the loosely many-flowered umbels; pedicels unequal, 3 or more times longer than the perigonium; petals deep rose, united at the base into a small cup, finally reflexed, oblong, obtuse, marked with a deeper colored median nerve (=vein), more than twice as long as the stamens; filaments subulate, springing from the tube of the perigonium; ovary ovoid, crowned with a subequal style and 3-lobulate stigma.

Tristagma chubutense Gandoger, in Bull. Soc. Bot. France 1919, 66: 292. 1920. It differs from *T. nivale* by its rigid somewhat broader leaves which are not circinate at the apex, the bracts, flowers, tube and divisions of the perigonium at least half smaller. It grows in Patagonia.

along the river Carrenlenfi, Chubut (Skottsberg no. 541). Scape enveloped at its base by broad, white, membranous scales; flowers 2—3 cm. long, the tube 10—11 mm. long, the segments recurved-stellate, sublinear; root thickened-fibrous. The remaining specimens sent by Philippi from the Chilean Andes perhaps represent a new species with the circinate leaves half as long as the scape, the (perigonium) tube deeply striate (along with the segments), at least 2.5 cm. long; hence should be named *Tristagma philippi* Gandoger.

Hymenocallis traubii Moldenke, *sp. nov.* Planta nana 10—17 :5 cm. alta; foliis 3 vel 4 lanceolatis 7.5—12 mm. latis; umbella biflora; floribus viridibus albisque satis fragrantis; ovario subsessili usque ad sessili oblongo; ovulis per loculo 4 vel 5; tubo tepalorum 3.3—3.9—4.6 cm. longo; segmentis tepalorum linearibus usque ad angustissime ellipticis 8.5—10 cm. longis; cupula staminali 3.5—4.5 cm. longa, basi breviter tubuloso sursum late infundibuliformi; filamentis 5.3—5.5 cm. longis; antheris introrsis erectis; polline flavo. Holotype: H. P. Traub #1056 (TRA), 7—15-1966; isotype #1057 (TRA); grown from bulbs collected by E. L. Brasol, near Daytona Beach, Florida.

Nerine x traubianthe Moldenke, *hybr. nov.* Planta inter N. filifoliam ♀ et clones varios hybridos Nerine ♂ hybrida, vigorem hybridum manifeste praebentes; scapis longissimis; floribus ilis N. filifoliae similibus sed plus majoribus; foliis linearibus 6 mm. latis. Holotype: H. T. Traub #1063 (TRA), 10-29-66.

Chlidanthus x *traubii* Moldenke, *hybr. nov.* Plantae hybridae reciprocae inter *C. fragrans* et *C. boliviensis;* habitu intermediae. Holotype: Traub #905 TRA, 5-14-62; paratype #910 TRA, 5-24-62.

ALLIUM TRAUBII SP. NOV.

T. M. Howard, *Texas*

While collecting various bulbous plants during my plant exploration excursions into Mexico and Guatemala, I have at various times collected a number of unidentified summer- and autumn-flowering *Allium* species in growing (and sometimes in flowering) condition. One of these, taken on Labor Day (September 6, 1965), in the State of Nuevo Leon, west of Monterrey, on top of a dry mountain just inside the Nuevo Leon-Coahuila State line, near the Coahuila border, was in full bloom. The mountain was reached by an excellently maintained new road which led to a tower at the summit, presumably a satellite tracking station or relay station, just off highway 40 (Saltillo-Monterrey highway) and Cuesta de los Muertos (Grade of the Dead). The elevation was approximately 6000 feet (approx. 1830 m.). The membranous coated bulbs reproduced vegetatively by division, and bore loose umbels of 8-16 flowers with light lavender tepals on scapes 15—25 cm. tall. This same *Allium* was taken again a month later in flower at Cerro del Obispado, a historic landmark (battle ground) within the western edge of the City of Monterrey, State of Nuevo Leon, October 3, 1965.

It differs markedly from the previously known species such as *A. glandulosum* and *A. kunthii* which are robust plants, with relatively

long upright leaves. In the Nuevo Leon plant, the leaves are relatively shorter, more slender, lax, glaucescent, medium green on the upper side, prominently 3-ridged on the underside, particularly when cultivated. It was given the collection number Howard #65-84. This species, along with several others from Texas, Mexico, and Guatemala were sent to Dr. Hamilton P. Traub in 1966 for study and identification. Dr. Traub informed me that several of these were apparently new, and that he would be pleased to assist in identifying them. It is with much pleasure that I name this new *Allium* #65-84, *Allium traubii* T. M. Howard *sp. nov.*, in his honor for his interest in this oft-neglected genus, and without whose help the identity of these plants might have continued to remain obscure. *Allium traubii* should be a welcome addition to the small group of fall-flowering half-hardy Alliums suitable for pot culture in the North and gardens in the South. Sub-freezing temperatures of short duration do not bother them in San Antonio, Texas and it is likely that they will be hardy further north as well.

Allium traubii T. M. Howard, *sp. nov.* Bulbo oblongo, deinique in bulbis duis verticaliter fisso, tunicis membranaceis; foliis deorsum vaginatis, partibus liberis 4—6, 11—19 cm. longis 2.5—2.75 mm. latis, supra glaucescentibus, subtus 3-carinatis; scapo subtereti; umbella 10—16-flora; floribus campanulatis perpallide lavandulaceis, vena media fusciora; pedicellis usque ad 1.2 cm. longis; staminibus quam tepalibus leviter brevioribus.

Bulb oblong, membranous coated, splitting vertically into two bulbs; leaves sheathing below, free portions 4—6, glaucent on upper surface, 3 ridged on under side, 11—19 cm. long, 2.5—2.75 mm. wide; scape subterete; umbel 8-16 flowered; flowers campanulate, very pale lavender, deeper mid-vein; pedicels to 1.2 cm. long; stamens slightly shorter than the tepals. Semi-arid mountains of Monterrey and vicinity, State of Nuevo Leon, Mexico. September-October.

The specimens have been deposited in the Traub Herbarium. Holotype (holonomenifer): T. M. Howard 65-84 (TRA No. 1061), 10-18-66, Mexico: State of Nuevo Leon, W. of Monterrey. Paratypes: T. M. Howard, n. s. (=1064 TRA), w. of Monterrey, Mex.; T. M. Howard n. s. (=1066 TRA), Cerro del Obispado, Mex.

CRINUM STRICTUM HERB, IN THE GUADALUPE LOWLANDS, TEXAS

Fred B. Jones, *Corpus Christi, Texas*

On Nov. 21, 1958, while doing field work in the marshy lowlands of the Guadalupe River between Green Lake and the shore of San Antonio Bay, I noticed a small patch of Crinum on the far side of a wide and rather deep ditch paralleling Highway 35 which traverses the area. The ditch was filled with water from recent rains, but by taking a circuitous route, I was able to reach the clump and take several scapes and leaves for pressing and a bulb or two for planting in my garden. The specimens became my No. 2698 and were deposited in the Welder Wildlife

Foundation and my personal Herbaria (two sheets were later sent to the Traub herbarium in La Jolla, California). The accompanying illustration shows the general aspect of the inflorescence (Fig. 26).

The bulbs were seated about 6 in. deep in the mud, connected by thick underground stems (rhizomes) and anchored by numerous thick-fleshy roots. The bulbs were about 4 cm. thick near base and gradually narrowed upward. Leaves were about 60 cm. long and 4-4.5 cm. wide. Scapes, 50-60 cm. long. Spathes about 6 cm. long. Umbels, at least 3 of them, 6-flowered. Tepaltubes 10-11 cm. long, about 6 mm. in diameter, slightly curved above. Tepalsegs about 8 cm. long, 1.5-2 cm. wide, white, spreading or somewhat recurved (the flowers had opened at least 16 hours before). Stamens ascending, about 5.5 cm. long, purple. Styles surpassing the stamens by about 2 cm., purple. On the fruiting umbels, the tepaltubes, all but the upper 1 or 2 cm., had become rather thick-fleshy and stiffish.

Fig. 26. Flower scape of **Crinum strictum.**

Checking available manuals and floras, I noted that Small, in *Manual of the Southeastern Flora* (1933) allowed *Crinum americanum* L. in Texas and gave Spring-Fall as its blooming season. His description of the species, however lacking in details, seemed to fit the Guadalupe lowland plants, so, being fairly sure that no other species had been reported from the state or was even to be expected, I determined our plant as *C. americanum* and it was so listed in the checklist of South Texas plants published in 1961 by the Welder Wildlife Foundation (Jones, F. B., C. M. Rowell, Jr. and M. C. Johnston, *Flowering Plants and Ferns of the Texas Coastal Bend Counties.*

On several collecting trips to the lowlands made at different times in the summer and fall months of 1959, 1960 and 1961, I saw not a

single Crinum. I presumed that the bulbs simply were out of bloom at these times, or if blooming, were hidden by tall weeds, grasses or woody vegetation. When I visited the area on Nov. 2, 1962, however, Crinums were again blooming. There were several small patches in the lowlands near the highway but none could be seen along the ditches. I very much wanted to collect bulbs of the plant, for those that I had taken along the ditch in 1958 had failed to become established in my yard. Looking about for a patch that could be reached without wading through water or mud, I came upon a number of bulbs lying on the ground near the site of a bridge that had been torn out recently (a new highway paralleling the old one was near completion). These bulbs were taking root as best they could and were putting out a few leaves. I took four of the larger ones for my garden.

The four bulbs leafed out in the spring of 1965 and bloomed in the earlier part of June. Two of them produced a second scape. The umbels were 2-3-flowered and the seed were allowed to mature. These germinated, incidentally, where they fell. In the fall, the older leaves yellowed and fell away but there remained a bunch of young, undeveloped leaves at the top of the bulbs. These, however, were eventually killed by frost or sub-breezing temperatures (not below 27 F.) so that the bulbs were leafless and apparently dormant.

In the spring of 1966, the first leaves appeared and about June 12, the first scapes were sent up. Flowers were open on June 23 and I took a scape for my herbarium (No. 6883) and on July 2, immature fruiting material (No. 6890). By pulling away the soil, I found that the bulbs were about 10 cm. long, including the basal plate, and 4-5 cm. thick near base. They were tapered upward and about 2 cm. in diameter at ground level. Leaves were about 60 cm. long and 4 cm. wide. Scapes 50-56 cm. long. Umbels 3-4-flowered. Spathes 8.5 cm. long. Tepaltubes 12-14 cm. long, slightly curved above. Tepals 8-10 cm. long, 1.3-1.7 mm. wide, spreading-recurved, white with traces of purple. Stamens and style purple above, whitish below. Anthers about 1 cm. long, the pollen yellow.

In 1965, I noticed that the buds drooped until nearly ready to open, so I made it a point to observe this peculiar behavior in 1966. When the spathes split, the developing buds are erect, but after a few days of growth, they assume a drooping position, that is, the tepaltubes become arched. On their opening day, they rise to an ascending or even erect position, that is, the tepaltubes become nearly but not quite straight. They finally burst open just before sundown.

Comparing the specimens of No. 2698, taken in the ditch in 1958, and those of 6883 and 6890, from the bridge in 1964 and grown in an ordinary half-shaded flower bed, I can see no significant differences. Of course the scapes from the ditch have 6-flowered umbels, but the 2-4-flowered umbels produced by the garden-grown bulbs may have been a consequence of insufficient moisture or other inadequacies. Not to be overlooked, too, is the disparity in time of flowering between the garden-grown bulbs which flowered in June in two successive years, and those

growing in the wild which, so far as I have been able to determine, bloom in November or in October (there were maturing fruits on some of the November-flowering bulbs). The question of flowering time can only be settled by observing the plants in the lowlands over a period of years.

In the garden, *C. strictum* apparently has no special requirements. It takes about as much space as an ordinary amaryllis, much less than most crinums, and if an occasional young bulb shoots up some distance from the parent, it can be removed if not wanted. The foliage is attractive and graceful, the flowers beautiful and not too fragrant. The blooming season, in my experience, is much too brief, but it could possibly be extended by keeping the soil quite damp or planting the bulbs in a place that stays wet most of the time.

AMARYLLID NOTES, 1967

Hamilton P. Traub

Leucocoryne volkmannii (R. A. Phil.) Engl. ex Traub; *comb. nov.*, syn—*Latace volkmannii* R. A. Phil., Anal. Univ. Chil. 93: 274. 1896; Engl. Nat. Pflamzenfam. 15a: 325. 1930; Traub, Gen. Amaryll. 35. 1963.

Tristagma uniflorum forma *album* (Weathers) Traub, *comb. nov.* Syn.—Weathers, Bulb Book, 117. 1911; *Beauverdia uniflora* f. *alba* Herter, in Boissiera 7: 512. 1943.

Tristagma uniflorum forma *violaceum* (Voss) Traub, *comb. nov.* Syn.—Voss, in Vilmorin, Blumeng. 1116. 1895; *Ipheion uniflorum* f. *violaceum* (Voss) Stearn, Gard. Chron. Aug. 14, 1943, p. 61.

Tristagma uniflorum forma *conspicuum* (Bak.) Traub, *comb. nov* Syn.—*Triteleia conspicua* Bak., in J. Linn. Soc. Bot. 11: 382. 1871.

Tristagma uniflorum forma *tenuipetalum* (Herter) Traub, *comb. nov.* Syn.—*Beauverdia uniflora* f. *tenuipetala* Herter, in Boissiera 7: 512. 1943.

Tristagma uniflorum forma *roseoplenum* (Herter) Traub, *comb. nov.* Syn.—*Beauverdia uniflora* f. *roseoplena* Herter, in Estud. Bot. Reg. Uruguay IX, Montevideo (1928-1929), color plate & text fig.; Herter, in Boissiera 7: 512. 1943.

Nectaroscordum tripedale (Trautv.) Traub, *comb. nov.* Syn.—*Allium tripedale* Trautv. in Act. Hort. Petrop. 2: 485. 1873.

Pancratium parvum subsp. *malabaricum* (Bak.) Traub, *subsp. nov* Syn.—*Pancratium parvum* var. *malabaricum* Bak. Amaryll. 119. 1888.

Stenomesson moldenkei Traub, *sp. nov.* (Amaryllidae.), *emend* (Plant Life 22: 62. 1966), Habitat: Peru: near Canta, Prov. Canta, Dept. Lima, on stony soil, alt. 2800-2900 m., Mar. 16, 1950.

Eucharis horsmannii (Bak.) Traub, *comb. nov.* Syn.—*Plagiolirion horsmannii* Bak., Gard. Chron. ii (1883) 38.

Eucharis tenera (Bak.) Traub, *comb. nov.* Syn.—*Calliphruria tenera* Bak. Amaryll. 112. 1888.

Eucharis sanderi subsp. *multiflora* (Bak.) Traub, *comb. nov.* Syn.—*Eucharis sanderi* var. *multiflora* Bak., Bot. Mag. 111: pl. 6831-B. 1885; Amaryll. 111. 1888.

Hymenocallis duvalensis Traub, *sp. nov.* Foliis 3 vel 4 usque ad 56 cm. longis, partibus superioribus linearibus, supra mediam 1.7 cm. latis, basi usque ad 1 cm. angustatis; umbella biflora; tubo tepalorum 5.5—6 cm. longo; segmentis tepalorum 7 cm. longis linearibus 3—4 mm. latis; cupula staminali 2.8—3 cm. longa; filamentis 1.8—2 cm. longis.

Bulb ovate, 3.5—4 cm. long, 2.5 cm. in diam., bulb-neck 6.5—8 cm. long, 1.5 cm. in diam., tunics brown. *Leaves* 3—4, up to 56 cm. long, linear in upper part, 1.3—1.5—1.7 cm. wide above the middle, narrowing toward the base, 1 cm. wide (base), apex bluntly acute. *Scape* 49—50 cm. long, slender. *Spathe* 2-valved, 3.3 cm. long, acute. *Umbel* 2-flowered. *Ovary* sessile, 8—9 mm. long, 5 mm. in diam.; ovules 2—3 per locule. *Tepaltube* 5.5—6 cm. long. *Tepalsegs* 7 cm. long; linear; 3—4 mm. wide, acute. *Staminal cup* 2.8—3 cm. long. *Filaments* 1.8—2 cm. long; anthers 1.4 cm. long, introrse, upright. *Style* overtopping the stamens; *stigma* capitate, minute.

Holotype: *G. F. Weber*, s. n. 4-29-28, Fairbanks, Fla., swamp (FLAS Nos. 6296 and 6297); Isotype—*Lillian Arnold* & *E. West*, s. n. Apr. 2, 1935, along stream in Hogtown swamp, (FLAS two sheets 6301 & 6302); & Paratypes: *J. R. Harris* C21135, St. Marys River, Ga., May 1. 1921, US No. 143572; *R. M. Harper*, Chatham County, coastal plain, Apr. 30, 1904, US No. 511197; *Chapman Herbarium* s. n. Apr. 1892, Apalachicola, Fla. U. S. No. 784926; *N. C. Fassett* no. 21162, Apr. 21-22, 1941, Escambia County, Fla., east of Pensacola, U. S. No. 1898650.

Notes.—In reviewing the genus *Hymenocallis* Salisb., in the southeastern United States, it was noted that a distinct species in s. e. Georgia and n. e. Florida had in the past apparently been included in a wider concept for *H. rotata* (Ker-Gawl.) Herb. This species is quite distinct and has been named in honor of Duval County, Florida.

Hymenocallis limaensis Traub, *sp. nov.* Parte $\frac{2}{3}$ superiore foliorum 1.5—1.9 cm. lata, foliis deorsum angustatis; scapo ca. 28 cm. longo, gracili; spatha lanceolata usque ad 5.5 cm. longa; umbella uniflora; pedicellis 5 mm. longis; tubo tepalorum 4.6 cm. longo; segmentis tepalorum 5.7—6 cm. longis; cupula staminali 2.6 cm. longa infundibuliformi; filamentis 2.5 cm. longis; stigmate breviter 3-lobato.

Bulb 4.3 cm. long, 2.8 cm. in diam., tunics brown. *Leaves* about 3, sheathing below, 1.5—1.9 cm. wide in upper $\frac{2}{3}$, acute, narrowing below. *Scape* about 28 cm. long (in specimen), but may be longer; slender. *Spathe* lanceolate, up to 5.5 cm. long, membranous. *Umbel* 1-flowered. Pedicel 5 mm. long. *Ovary* 6 mm. long, 4 mm. in diam. *Tepaltube* 4.6 cm. long, slender. *Tepalsegs* 5.7—6 cm. long, narrow-linear. *Staminal cup* 2.6 cm. long, funnel-shaped. *Filaments* about 2.5 cm. long. *Style* overtopping the tepalsegs; stigma shortly 3-lobed.

Holo-nomenifer (type): Mr. and Mrs. J. N. Rose No. 18634 (US 1319866), flowered in Washington, D. C. greenhouses in 1926 from bulbs collected in the vicinity of Lima, Peru, above Santa Clara.

Hymenocallis sinaloaensis Traub, *sp. nov.* Umbella 2—5-flora; ovario sessili, ovulis per loculam 2; tubo tepalorum 6—7 cm. longo gracillimo; segmentis tepalorum angustissimis linearibus 6.6 cm. longis; cupula

staminali 1.6—1.7 cm. longa; filamentis 3.2 cm. longis; stigmate minuto capitato.

Scape slender; umbel 2—5 flowered; ovary sessile, 7 mm. long, 4 mm. in diam.; ovules 2 per cell; tepaltube 6—6.2—6.8—7 cm. long, very slender; tepalsegs very narrow, linear, 6.6 cm. long; staminal cup 1.6—1.7 cm. long; filaments 3.2 cm. long; style overtopping the stamens; stigma minute, capitate.

Holo-nomenifer (type): J. G. Ortega no. 4176 (US 1083825), La Cruz, State of Sinaloa, Mexico, 1921.

Hymenocallis guatemalensis Traub, *sp. nov.* Foliis loratis sub anthesi immaturis usque ad 4 cm. latis; scapo 19—23 cm. longo; spatha lanceolata 5 cm. longa; umbella 5—7-flora; ovulis per loculam 2; tubo tepalorum 8.2—8.4 cm. longo; segmentis tepalorum anguste linearibus 8.2—8.7 cm. longis; cupula staminali 2.5 cm. longa; stigmate capitato.

Bulb globose, 5 cm. long, 4.9 cm. in diam., bulb-neck 2.5 cm. long, 2.1 cm. in diam., tunics brown. *Leaves* immature at flowering time, about 15 cm. long, lorate, acute, up to 4 cm. wide. *Scape* 19—23 cm. long. *Spathe* membranous, narrow, lanceolate, acute, or truncate, 5 cm. long. *Umbel* 5—7-flowered. *Ovary* sessile, 1.2 cm. long, 5 mm. in diam., ovules 2 per cell. *Tepaltube* 8.2—8.4 cm. long. *Tepalsegs* narrow-linear, 8.2—8.7 cm. long. *Staminal cup* 2.5 cm. long. *Style* overtopping stamens; stigma capitate.

Holonomenifer (type): H. Pittier No. 126 (US 472779), Apr. 19, 1905, along the shore of Lake Amatitlan, alt. 1250 m., Guatemala.

Narcissus tazetta subsp. *chinensis* var. *pleniflorus* Traub, *var. nov.*—A forma typica speciei floribus plenis et planta minus valida recedit. A double form *N. tazetta* subsp. *chinensis*. Holotype: Traub #135 (TRA), 11-16-50.

Tristagma uniflorum f. *pauciflorum* Traub, *forma nov.*—A forma typica speciei umbella 2—3-flora recedit.

Hymenocallis floridana subsp. *amplifolia* Traub, *subsp. nov.* A subspeciei typica foliis 2.6—3.5—3.8—4—4.2 cm. (nec. 0.8—1—1.3—1.5—1.8—2 cm.) latis recedit. *Leaves* 2.6—3.5—3.8—4—4.2 cm. wide as contrasted with 0.8—1—1.3—1.5—1.8—2 cm. wide in subsp. *floridana*. Holotype (holonomenifer): F. West, A. N. Tissot & W. B. Tisdale, s.n. May 11, 1935; FLAS 10473 + 10474.

Hymenocallis galvestonensis subsp. *angustifolia* Traub, *subsp. nov.* A subspeciei typica foliis 1.5—1.8—2 cm. (nec. 2.3—2.6—2.8—3—3.2—3.5—3.8 cm.) latis recedit. *Leaves* 1.5—1.8—2 cm. wide as contrasted with 2.3—2.6—2.8—3—3.2—3.5—3.8 cm. wide in subsp., *galvestonensis*. Holotype (holonomenifer): Biltmore Herbarium H/60, Mobile, Ala. Apr. 24, 1899; US No. 980051.

Hymenocallis bolivariana Traub, *sp. nov.* This plant is similar to *Hymenocallis bistubata* Herb. (1844)—See also Sealy, Kew Bull. 239. 1954—in the length (somewhat longer than 5 cm.) and type of the tepaltube, but differs from it in the type of the leaves which are more or less strap-shaped and only 5.8 cm. wide above the middle, narrowed to 2.3 cm. wide at the base, whereas they are subpetiolate, 10 cm. wide in *H. bistubata*—which is more than 4 cm. wider than in our plant. In

addition, our plant has a shorter scape, slightly longer tepaltube and longer tepalsegs. Apparently, this plant from Venezuela cannot be equated with *H. bistubata*, and it is named for the Liberator of South America: *Hymenocallis bolivariana* Traub, *sp. nov.*

Foliis loriformibus supra mediam 5.8 cm. latis; umbella 8-flora; ovario sessili; tubo tepalorum usque ad 14.5 cm. longo; segmentis tepalorum 12 cm. longis; cupula staminali 5.5 cm. longa; filamentis 3—3.2 cm. longis.

Leaves strap-shaped, 5.8 cm. wide above the middle, narrowing to 2.3 at the base, apex acute to bluntly acute, 34—35 cm. long. *Scape* above 28 cm. long (preserved only in part). *Spathe* about 6.5 cm. long, ovate, acute. *Umbel* 8-flowered. *Ovary* sessile, oblong, 1.3 cm. long, 8 mm. in diam., ovules 5 per locule. *Tepaltube* 14.5 cm. long. *Tepalsegs* 12 cm. long, linear, 6 mm. wide. *Staminal cup* 5.5 cm. long, tubular for 4 cm. below, funnel-shaped above. Filaments 3—3.2 cm. long. *Anthers* extrorse, versatile. *Style* overtopping the stamens by 3 cm. Holonomenifer: F. D. Smith 182 (US 2121420) sheets 1 & 2, June 6, 1950, Caicara, Monagas, Venezuela.

Hymenocallis repanda Otto & Dietrich, *emend.* Traub. *Hymenocallis repanda* Otto & Dietrich, Allg. Gartenz. 11: 123.. 1843; Sealy, Kew Bull. 240. 1954.

Bulb globose, about 7.5 cm. long. *Leaves* broad-lance-strap-shaped, acute, up to 60 cm. long, 7.5 cm. wide, somewhat upright, flat, rather thin, light green, many-nerved. *Scape* about 60 cm. long, compressed, with sharp edges, upright. *Spathe-valves* 2, acute, whitish, about 5 cm. long. *Umbel* about 10-flowered. *Ovary* sessile, trigonous, 1 cm. long, wider than the tepaltube. *Tepaltube* 10 cm. long, slender, greenish below, whitish above. *Tepalsegs* reflexed, as long as or almost as long as the tepaltube, linear, acute, about 4 mm. wide, the base adnate to the base of the staminal cup, snow white. *Staminal cup* pure white, about 5 cm. long, funnel-shaped, about 2.5 cm. across at the apex, the margins between the filaments slightly wavy. *Filaments* a good 5 cm. long, a little longer than the staminal cup, filiform, green; anthers (versatile), attached below the middle, very narrow-linear, arcuate, (pollen) orange. *Style* overtopping the anthers by about 1.25 cm.

Sealy (1954) indicated that it was described from a "cultivated plant with leaves like those of the *caribaea*-alliance, and flowers which agree with those of *H. latifolia* except for the staminal cup which is described as almost 5 cm. long, whereas in *H. latifolia* the cup does not exceed 3 cm." This is correct, excepting that Otto & Dietrich (1843) indicate that in the case of the tepalsegs, the bases are adnate to the base of the staminal cup which places it in the *littoralis*-alliance.

Eucharis butcheri Traub, *sp. nov.* Foliis 2 petiolatis, laminis ellipticis 11 cm. latis; umbella uniflora; floribus albis; tubo tepalorum parte 4/5 inferiore viridi; pedicellis 8 mm. longis; tubo tepalorum recto 4.8 cm. longo sursum gradatim ampliato; segmentis tepalorum ovatis 2.7 cm. longis 1.6—2.2 cm. latis; cupula staminali nulla; filamentis 8 mm. longis, dente 2 mm. longo basi utrinque ornatis; stigmate late 3-lobato.

Holotype: J. N. Giridlian s. n. (= #1051 TRA), 8—10—66, grown at Arcadia, Calif. from bulbs collected by Harry P. Butcher in Panama.

Section *Caulorhizideum* Traub, *sect. nov.*, Genus *Allium* L. Bulbis caespitosis in rhizomatibus iridoidibus productis; vestimentis bulbi striatis, cellulis elongatis serialibus verticalibus regularis et fibris persistentibus parallelis formatis; foliis planis; ovario rarissime cristato. Type: *Allium validum* S. Wats.

Section *Lophioprason* Traub, *sect. nov.*, Genus *Allium* L. Ovario plerumque cristato saepe manifeste cristato; vestimentis bulbi sine reticulo fibroso persistenti. Type: *Allium sanbornii* Wood.

Subsection *Cernuae* Ownbey ex Traub, *subsect. nov.*, Sect. Lophioprason Traub, Genus *Allium* L. Foliis per scapum ultra 2; ovario cristato; bulbis plerumque elongatis. Type: *Allium cernuum* Roth.

Subsection *Falcifoliae* Ownbey ex Traub, *subsect. nov.*, Sect. *Lophioprason* Traub, Genus *Allium* L. Foliis per scapum 2 (vel 1) saepe planis vel falcatis; cristis ovarii plerumque debiliter evolutis; scapo plerumque complanato; seminibus saepe per modam volutatim despersis. Type: *Allium falcifolium* Hook. & Arnott.

Subsection *Sanbornae* Ownbey ex Traub, subsect. *nov.*, Sect. *Lophioprason* Traub, Genus *Allium L.* Folio per scapum solitario (praeter species una foliis per scapum duis); ovario manifeste 6-cristato, partibus saepe laceratis. Type: *Allium sanbornii* Wood.

Subsection *Acuminatae* Ownbey ex Traub, *subsect. nov.*, Sect. *Lophioprason* Traub, Genus *Allium* L. Species cellulis interioribus vestimentorum interiorum bulbi incrementum secundarium efferentibus plerumque designata; foliis per scapum 2—4, rare 1; ovario plerumque inconspicue cristato. Type: *Allium acuminatum* Hook.

Subsection *Campanulatae* Ownbey ex Traub, *subsect. nov.*, Sect. *Lophioprason* Traub, Genus *Allium* L. Species cellulis interioribus vestimentorum interiorum bulbi incrementum secundarium efferentibus plerumque designata; foliis per scapum plerumque duis; ovario manifeste 6-cristato. Type: *Allium campanulatum* S. Wats.

TRAUB: AMARYLLID NOTES, 1967—continued on page 110.

AMARYLLIDS FLOWERED IN SOUTHERN CALIFORNIA

Hamilton P. Traub

During the year 1966, various amaryllids flowered at the home of the writer in La Jolla, California. Snap-shots were obtained of some of these and are reproduced with this brief article.

CRINUM BRASILENSE

This species was described in the 1966 PLANT LIFE (page 45). It bloomed again on July 4, 1966 when the snap-shot was obtained. As grown in southern California, the leaves appear as a sub-rosette as shown in Fig. 27. It is a beautiful plant, with fragrant flowers, but the flowers are not long lasting.

Fig. 27. **Crinum brasilense** as flowered at La Jolla, Calif., July 4, 1966.

CRINUM LUTEOLUM

The two forms of *Crinum luteolum* which were kindly supplied by Mr. William Morris of Australia, again bloomed in 1966 at two different times. The form with relatively long tepalsegs (Fig. 28) is somewhat superior to the one with shorter, wider tepalsegs. During the first blooming period, the plants in each case were selfed, and only one or two seeds were obtained. During the second flowering period, the two forms were crossed reciprocally with surprising results as shown in Table 1.

Table 1. Seeds obtained by crossing two forms of **Crinum luteolum** reciprocally in 1966. A single scape was involved in each case.

	Number of seeds per fruit	Total
Form with short tepalsegs	13—15—13—14—10—11—9—10—10—8—1	114
Form with longer tepalsegs	15—6—6—5—1—3—3	39
	Grand Total	153

Thus it will be noted that when different seedlings are cross-pollinated a large number of seeds were obtained. This makes it possible to increase this beautiful plant very rapidly.

Fig. 28. Crinum luteolum Traub & Hannibal, a form with relatively long tepalsegs, as grown at La Jolla, Calif., 1966.

CHLIDANTHUS X TRAUBII

It has been reported before that *Chlidanthus fragrans* is not a dependable bloomer. When grown in a semi-arid location, it produces scant foliage and 2-flowered scapes, but may skip some seasons. When grown with normal summer watering, it produces abundant leaves and the umbels may be 2—3—4—5-flowered. After a few years it makes a large clump with many long leaves and flowering declines to a few flowering umbels. Thus, it is an unsatisfactory plant unless one can work out a culture which discourages rapid formation of offsets. Some

have suggested planting deeply but the writer has not experimented with this procedure.

Chlidanthus boliviensis is a plant from the semi-arid mountains in Bolivia and gradually declines under ordinary garden culture, and finally dies. However, before it died, the writer crossed it with *Chlidanthus fragrans* and obtained a very vigorous hybrid intermediate between the two species. This hybrid can be grown under ordinary garden culture and blooms each season without forming large clumps. It solves the problem for those who wish to have a fragrant *Chlidanthus* in their garden. It sets some seeds when hand pollinated so that rapid increase can be obtained.

Fig. 29. **Chlidanthus x traubii** Moldenke as flowered at La Jolla, Calif., 1966.

HYMENOCALLIS VELARDEI

Hymenocallis velardei blooms each season in the garden (July), sometimes again in the late fall or winter. As the illustration (Fig. 30)

shows, it is not a brilliant success as a flowering plant, but it should be useful in making additional hybrids with *Hymenocallis narcissiflora* and *H. amancaes* or even other *Hymenocallis* species. Such hybrids should be fine companions to the well-known *Hymenocallis* x *festalis* Worsley (1905).

Fig. 30. **Hymenocallis velardei** Traub, as flowered at La Jolla, Calif., July 2, 1966.

EARLY FORM OF BRUNSVIGIA X PARKERI

A few years ago, Mr. William Morris of Australia kindly sent a large bulb of an amaryllid resembling *Brunsvigia josephinae*, but with somewhat larger flowers. He asked that it be identified. When it flowered in 1965 and again in 1966 (fig. 31) it was at once evident that it represented an early form of *Brunsvigia* x *parkeri* which was illustrated in a past issue of Plant Life (see Traub & Hannibal, Plant Life 16: 39-62. 1960). The color of the flower is a beautiful deep pink and the presence of fragrance proves that *Brunsvigia rosea*, the Cape Belladonna is one of its ancestors. This is a beautiful addition to any garden with a Mediterranean type of climate. It has to be kept relatively dry, with only occasional watering during the summer, and copious watering during the growing season in winter.

Fig. 31. **Brunsvigia x parkeri,** one of the original hybrids between **Brunsvigia rosea** and either **B. josephinae** or **B. grandiflora.** Its hybrid nature is given away by the fragrance inherited from **B. rosea.** Photo by Mrs. Marjorie Anthes.

Fig. 32. **Left, Brunsvigia grandiflora,** from Eastern Cape Province; and **right, Brunsvigia radulosa,** from central (Great) Karoo of Cape Province. Photos by Leon Boshoff-Mostert.

BRUNSVIGIAS IN THEIR NATIVE HABITAT

The following subjects did not flower in the writer's garden, but represent illustrations (Fig. 32) sent in by Mr. Leon Boshoff-Mostert who observed them in their native habitat in South Africa. At the left is shown *Brunsvigia grandiflora*, with umbels up to 30-flowered. It is native to the Eastern Cape Province from Uitenhange and Alexandria Division eastward to Natal. At the right is shown *Brunsvigia radulosa* which is native to Bechuanaland, the central (Great) Karoo of Cape Province, Orange Free State, Lesotho, Natal and Transvaal.

ON THE KARYOLOGY AND PHYLOGENY OF TULBAGHIA

ROUX WILSENACH, *Dept. of Botany, University of the Witwatersrand, Johannesburg, South Africa*

According to previous reports (Whitaker and Flory, 1955; Riley and Hoff, 1958; Mookerjea, 1955; Sharma, 1956; Flory, 1955 and Smith and Flory, 1965,) the basic chromosome number of *Tulbaghia* is 6, but both diploid and tetraploid forms have been reported. In the present report 6 was again found to be the basic chromosome number, but greater variation was recorded.

Tulbaghia and *Agapanthus* are commonly grouped in one tribe, but Traub (1963) separated them completely, grouping *Tulbaghia* with genera like *Allium* in the tribe *Allieae*. In the present study some suggestions are made on the phylogeny of this genus.

MATERIAL AND METHOD

Most samples were collected in their natural habitat, their root tips were fixed in Craf for at least 12 hours and subsequently transferred to 70% alcohol, followed by dehydration and paraffin wax embedding. Sections of root tips were 14-20 microns thick.

Sections were stained in a 1% aqueous solution of Crystal Violet, following the method of Smith (1934). Drawings were made with the aid of a netmicrometer in the eyepiece.

RESULTS

The longest chromosome pair is often over 20 microns in length and the shortest over 10 microns. It is often difficult to identify the different chromosome pairs (see eg. Chromosomes B, C, D and E of *T. alliacea*).

In the idiograms the chromosomes are generally arranged from the longest to the shortest, but exceptions occur (eg. chromosome C is occasionally longer than chromosome D) in order to facilitate comparison of the idiograms of the different species.

1. *Tulbaghia alliacea* L. f. . . . *2n=12* (collected in Peddie district, Cape Province). This species has a very symmetric karyotype, there is

little variation in length of the chromosomes and all the pairs have sub-median centromers. No secondary constrictions could be identified; see Fig. 33 (1) and Fig. 35 (13).

2. *Tulbaghia ludwigiana* Harv. Cultivated. *2n=12.* The karyotype of this species is very similar to that of *T. alliacea* as described above. Occasionally tetroploid cells are noticed amongst the normal diploid cells in the root tips. These tetraploid cells are bigger than the adjoining diploid cells; see Fig. 33 (2, 3) and Fig. 35 (14).

3. *Tulbaghia violacea.* Baker *2n=12* (Collected in the Alice district, Cape Province). Chromosomes A, B and D have sub-median centromeres whereas chromosome C has a proximal arm less than a third of the length of the distal arm (sub-terminal centromere), chromosome E has a median centromere and chromosome F has a secondary constriction in addition to the sub-median centromere; see Fig. 33 (4) and Fig. 35 (15).

4. *Tulbaghia galpinii.* Schltr. *2n=12* (Collected in the Alice district, Cape Province). This idiogram is very similar to that of *T. violacea* as described above, but chromosome C has a much longer proximal arm and chromosome F has no secondary constriction and a very short proximal arm; see Fig. 33 (5) and Fig. 35 (16).

5. *Tulbaghia fragrans,* Verdoorn. *2n=12.* This species was collected at three places: Cultivated in Pretoria, cultivated in Johannesburg, and in its natural habitat at the Letatsa river. The idiograms were practically identical.

Three chromosomes (A, B and F) have median centromeres and the other three have sub-median centromeres. No secondary constrictions could be identified.

In one root tip of the plant cultivated in Pretoria all the dividing nuclei showed 13 chromosomes. Two chromosomes (or chromosome derivatives) were much shorter than the others (labelled fr. 1 and fr. 2 in Fig. 33 (7)).

In one of these a centromere could be identified, but not in the other. The most apparent explanation of this phenomenon is that one of the long chromosomes (perhaps chromosome A) fragmented close to the centromere. Riley and Hoff (1958) recorded such an occurrence in *T. violacea* also. This would mean that the one fragment was without a centromere and one would expect such a fragment to become lost from some nuclei, but this was not the case in this root tip. Lima-de-Faria (1955) has demonstrated in rye that such a fragment with a deleted centromere can be capable of movement at anaphase and it will then divide regularly. This seems to be the explanation also in the anomalous root tip here observed; see Fig. 33 (6, 7) and Fig. 35 (17).

6. *Tulbaghia leucantha,* Baker. *2n=12.* From Alberton district, Transvaal.

The idiogram of this species is very similar to that of *T. violacea* as described above, but no secondary constrictions could be observed; see Fig. 33 (8) and Fig. 35 (18).

Fig. 33. **Tulbaghia** chromosomes: **1.: Tulbaghia alliacea** 2n = 12; **2.: T. ludwigiana** 2n = 12; **3.: T. ludwigiana,** an occasional tetraploid cell; **4.: T. violacea,** 2n = 12; **5.: T. galpinii** 2n = 12; **6.: T. fragrans** 2n = 12 (from Letaba); **7.: T. fragrans** (cultivated), showing two fragments **fr. 1** and **fr. 2; 8.: T. leucantha** 2n = 12.

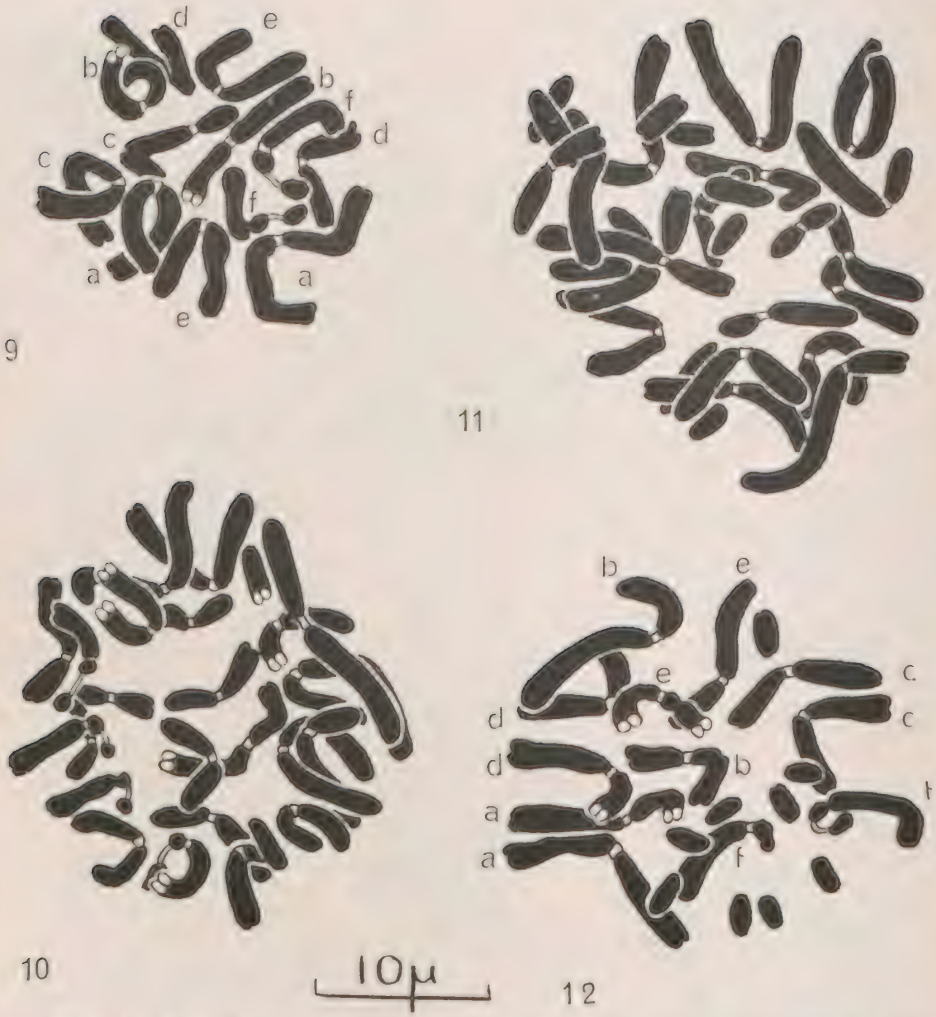

Fig. 34. **Tulbaghia** chromosomes: **9.**: **Tulbaghia** species collected at Linmeyer. 2n = 12; **10.**: same species, showing tetraploid cell in tetraploid root of a diploid plant; **11.**: **Tulbaghia** species collected at Nelspruit. 2n = 28, interpreted as a tetraploid with 4 extra chromosome derivatives or B chromosomes; **12.**: **Tulbaghia** species collected at Hammanskraal, 2n = 12, but in addition to these there are 9 B chromosomes.

7. *Tulbaghia* species collected at Linmeyer, Transvaal. *2n=12* Chromosomes A, B and E have median centromeres, the others have sub-median centromeres. Chromosome F had a very pronounced secondary constriction in the proximal arm. This constriction is often so pronounced that the satellite is connected to the rest of the chromosome by rather long slender thread.

On a diploid plant one root was found in which all the cells were tetraploid; see Fig. 34 (9, 10) and Fig. 35 (19).

8. *Tulbaghia* species collected at Nelspruit, Transvaal. *2n=28.*

No idiogram could be prepared because the chromosome complex is very difficult to analyse. In contrast to most of the other species investigated some (±8) chromosomes were very much shorter than the rest.

At telophase four nucleoli were formed in the nuclei; see Fig. 34 (11).

9. *Tulbaghia* species collected at Hammanskraal. *2n=12+8 or 9 B chromosomes.*

The idiogram of this species is quite similar to that of the Linmeyer specimens, but in addition to the normal 12 chromosomes there were usually 9 (occasionally 8) much smaller chromosomes. The centromeres could not be identified with any certainty in these small chromosomes.

These chromosomes have been interpreted as B chromosomes, because they were much smaller than the others and because they occur in both odd and even numbers (Darlington, 1956). Their behaviour was not studied at meiosis to determine whether they paired or not with the A's (according to Darlington B chromosomes don't pair with A's at meiosis), with the result that their description as B chromosomes must be considered as a tentative one only; see Fig. 34 (12) and Fig. 35 (20).

DISCUSSION

The genus *Tulbaghia* is in need of revision. Some species are well defined, but it is often difficult to identify plants. The species *T. leucantha*, for example, differs from *T. acutiloba* mainly in the colour of the perianth which is white in *leucantha* and green in *acutiloba*. In one community near Alberton all the possible variations in perianth colour were found. These plants were tentatively named "*T. leucantha*".

The idiograms of *T. violacea, T. fragrans, T. leucantha, Tulbaghia* from Linmeyer, *T. alliacea* and *T. ludwigiana* were remarkably similar and all have 12 somatic chromosomes. Only minor structural chromosomal changes could have been involved in speciation in these plants.

Polyploid cells have been found in normal plants by Mookerjea (1955), and by the present author in *Tulbaghia ludwigiana*. In the plants collected at Linmeyer one tetraploid root was found. The *Tulbaghia* collected at Nelspruit was a tetroploid, but there are apparently also four fragments or B chromosomes in this complex.

Smith and Flory (1965) reported for *T. leucantha* from South Africa 12 as the diploid number and 24 for plants of the same species collected

in Rhodesia. In the plants collected in South Africa in the present study 12 was also reported as the diploid number.

For *T. ludwigiana* Smith and Flory (1965) reported 2n=24 as the chromosome number. They suggested the possibility that *T. ludwigiana* has been derived from *T. alliacea*, but they mention also the possibility that the plant could have arisen by allopolyploidy. In the present study 2n=12, has been reported for *T. ludwigiana*, but occasional tetraploid cells were also recorded. *T. ludwigiana* must there-

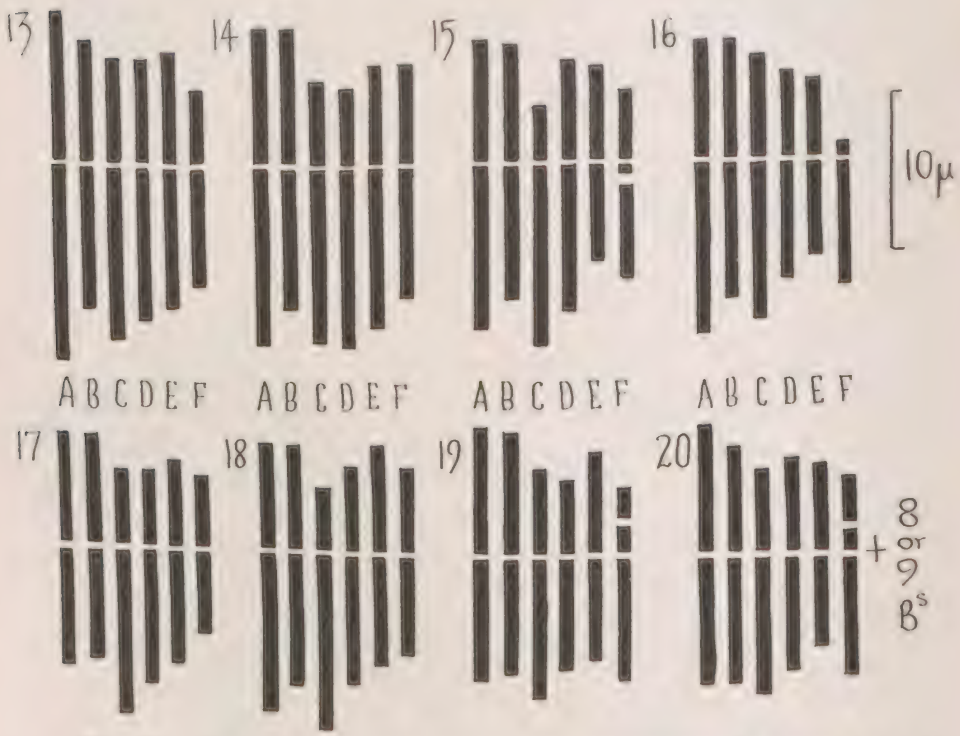

Fig. 35. Idiograms for the species: **13.: Tulbaghia alliacae; 14.: T. ludwigiana; 15.: T. violacea; 16.: T. galpinii; 17.: T. fragrans; 18.: T. leucantha; 19.: T.** species (Linmeyer); **20.: T.** species (Hannanskraal).

fore also be considered as a species with two levels of ploidy as was reported for *T. leucantha* by Smith and Flory (1965).

Polyploidy thus occurs in: (a) isolated cells of one plant; (b) in whole roots of some plants; (c) in some communities of some species; (d) some species appear to be polyploid (eg. the species from Nelspruit).

Smith and Flory (1965) did remark on the presence of SAT chromosomes in *Tulbaghia* and their absence in the genus *Agapanthus*. This must not be considered as an important difference, because no secondary

constrictions could be observed by the present author in six of the taxa here investigated, whereas they were most conspicuous in other species of the same genus.

Smith and Flory (1965) found two sec. constrictions in *T. alliacea* (one of which was very conspicuous) but the present author could not observe any in this species. These differences must be due to the fact that the secondary constrictions are often very inconspicuous and that these inconspicuous secondary constrictions may become clear in some pretreatments and different fixations. *T. fragrans*, for example, has no apparent secondary constriction when fixed in Craf, but the present author has often used this as class material for students (fixing in Carnoy) and it is then occasionally possible to see a secondary constriction in the typical position for this genus is very close to the centromere in the proximal arm. The absence of secondary constrictions can therefore only be assumed after various fixatives and pretreatments were tried.

B chromosomes and/or fragments were also recorded in the present study, and in one case this was also recorded in a polyploid. Variation in the basic chromosome number in this genus, may be due to this phenomenon, but this aspect will involve a detailed study. In plants of *T. acutiloba* the present author found 14 somatic chromosomes, but because it was impossible this far to find out whether the extra two were mere fragments or extra chromosomes the result was not reported in detail in this account.

ON THE PHYLOGENY OF TULBAGHIA

Hutchinson (1934) and Pax and Hoffman (1930) grouped *Tulbaghia* and *Agapanthus* in one tribe. Mookerjea (1955) saw no karyological evidence against grouping them together and although Smith and Flory (1965) did not commit themselves, they pointed out that karyological and morphological differences are present between the two genera.

Traub (1963) has separated them completely, bringing *Tulbaghia* much closer (in fact in the same tribe) with *Allium*. The present author is in agreement with Traub (1963) that *Tulbaghia* and *Agapanthus* should not be considered as closely related, because of: (a) chromosome size differences; (b) differences in basic number; (c) the presence of a corona in *Tulbaghia*.

In a description of *Cryptostephanus vansonii* Verdoorn (1943) remarked that she had to consider both the genera *Tulbaghia* and *Clivia* (*Tulbaghia* because of the presence of a corona, and *Clivia* because of its remarkable vegetative resemblance to this plant.) It is therefore not unreasonable to suggest that *Cryptostephanus* occupies an intermediate position between *Tulbaghia* and *Clivia*. Gouws (1949) included *Cryptostephanus* and *Clivia* in one tribe on karyological data, and so did Traub (1963). The suggestion that *Tulbaghia* may be more closely related to *Cryptostephanus* is however a new one.

Cryptostephanus has 24 chromosomes and when the idiogram of Gouws is studied a striking feature is noticed: the "haploid" set can be arranged into six pairs, four of which are almost identical. It thus seems possible that *Cryptostephanus* could have evolved from a 2n=12 ancestor by polyploidy. A possible relationship between the *Tulbaghia* and *Cryptostephanus* can be shown as in Fig. 36 (Diagram 1).

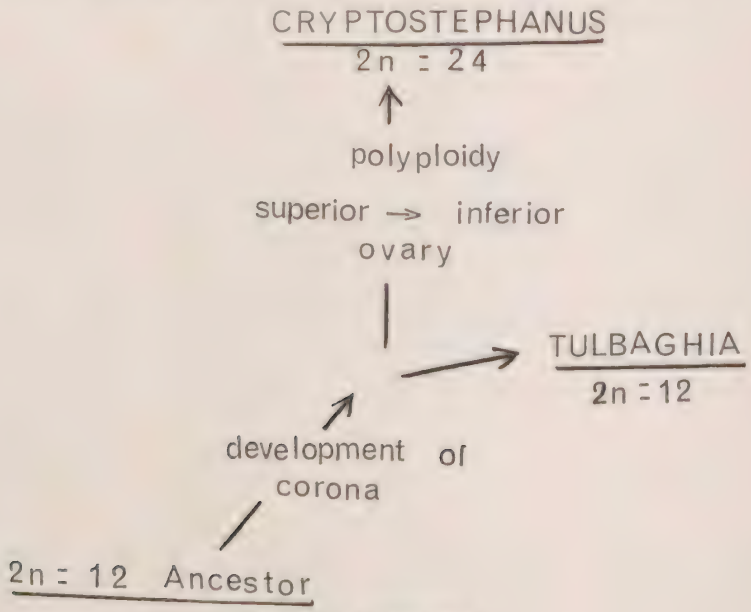

Fig. 36. Diagram 1.

SUMMARY

Twelve has been reported as the diploid chromosome number for eight taxa of *Tulbaghia* in this study, and this supports previous reports so that 6 can be assumed to be the basic chromosome number.

Polyploidy occurs quite commonly in this genus and can be seen in: (a) a few cells only; (b) in some roots of diploid plants; (c) in some individuals or communities; (d) in some species.

Fragments without centromeres have been recorded, and these apparently can move at anaphase.

B chromosomes have been recorded in some taxa. It was suggested that *Tulbaghia* and *Agapanthus* should not be included in the same tribe, and a hypothesis that *Tulbaghia* may be linked to *Cryptostephanus* by a common ancestry was offered.

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REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. Edward F. Authement, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones. 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on should be addressed to Mr. Edward F. Authement, *Registrar,* 2214 Gallier St., New Orleans, Louisiana 70117. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

NEW AMARYLLIS BREEDERS 1966

Abbrev.
Beck., E. M.—Mr. E. M. Beckham, 1452 Glenmore Ave., Baton Rouge, La.
Rob.—J. J. Robertson, 8218 Nelson St., New Orleans, La.
Pahls—Lydia C. Pahls, 3035 S.W. 15th St., Miami, Fla.
Schmidt—J. T. Schmidt, Rt. 1, Box 48, Prairieville, La.

AMARYLLIS CLONES REGISTERED IN 1966

EDWARD F. AUTHEMENT, *Registrar*

Registered by Mrs. Lydia C. Pahls, 3035 S.W. 15th St., Miami, Fla.

'Frank Pahls' (Pahls—1965), R; A-843, D-7; U-2fld; 17″h; fls.7″ diam; solid red, light streaks in throat; spr.

Registered by Mr. E. M. Beckham, 1452 Glenmore Ave., Baton Rouge, La.

'Salmon Halo' (Beck., E. M.—1966), R; A-844, D-5A; U-4fld; 23½″h; fls.7″ diam; jasper red (HCC-018.1), greenish throat blending to white midribs, picotee edged; spr.

'Midget' (Beck., E. M.—1966), R; A-845, D-8; U-6fld; 15-16″h; fls. 3-3½″ diam; turkey red (HCC-721), slight whitish midrib halfway up segs.

Registered by J. J. Robertson, 8218 Nelson St., New Orleans, La.

'Maxine' (Rob.—1966), R; A-846, D-5A; U-4fld; 19″h; fls.7″ diam; blood red (HCC-820.1), glossy throat, greenish midrib on setsegs only.

Registered by Mr. Frederick B. Schmitz, Rt. 1 Box 138, Port Sulphur, La.

'Phoebe' (Schm.—1966), R; A-847, D-5A; U-3-4fld; 15″h; fls.7″ diam; vermilion (HCC-18.1) with pale green throat blending to white, minute vermilion spots each side of midribs; spr.

Registered by Ludwig & Co., Hillegom, Holland.

'Indian Orange' (Lud.—1966), R; A-848, D-5A; U-4fld; 28-30″h; Fls. 9″ diam; indian orange with a suggestion of azalea pink in middle of the petals; spr; de.

'Red Flag' (Lud.—1966), R; A-849, D-5B; U-4fld; 25-27″h; fls.8″ diam; orient red (HCC-819); spr.

'Red Lining' (Lud.—1966), R; A-850, D-5B; U-4fld; 24-26″h; fls.8″ diam; pure white, red edged, petsegs slightly red speckled; spr; de.

'Red Man' (Lud.—1966), R; A-851, D-8; U-5-7fld; 20″h; 5-6″ diam; scarlet, with slight darker throat; spr; de.

'The Alamo' (Lud.—1966), R; A-852, D-5A; U-4fld; 26-28″h; fls.8″ diam.; blood red with darker glossy throat; spr; de.

'Twinkling Star' (Lud.—1966), R; A-853, D-8; U-4-5fld; 20-22″h; fls.5-6″ diam; white, picotee edged; spr; de.

Registered by Mr. J. T. Schmidt, Rt. 1, Box 48, Prairieville, La.

'Manchac Peach' (Schmidt—1966). R: A-854, D-513; U-4ffd; 19"h; fls.7" diam; peach pink to salmon pink, white midrib in two lower setsegs, white midrib bordered red in two upper setsegs; spr; de.

NEW HYBRID CYRTANTHUS CLONES

Registered by Aleck Korsakoff, 7634 Oriole St., Jacksonville, Fla. 32208

Cyrtanthus x *henryae* clone *'Meta'*. Named in honor of his wife. The flower color is fire red (HCC 15/2) outside of the tube, and brick red (HCC 16/2) inside the flare of the tepalsegs; scape about 10 inches long, pedicels 1¼ inches long.

Cyrtanthus x *henryae* clone *'Tanurochka'*. Named in memory of a childhood friend. The flower is porcelain rose (HCC 620) outside of the tube, and Delft rose (HCC 020/2) inside the flare of the tepalsegs, about ⅝-inch across the apex of the flower; scapes about 13 inches tall.

EUCHARIS KORSAKOFFII SP. NOV.

HAMILTON P. TRAUB

In 1965, Mr. Lee Moore, of P. O. Box 504, Kendall, Florida and Casilla 498, Iquitos, Peru, the plant explorer, collected an amaryllid

Fig. 37. Lee Moore on expedition on which **Eucharis korsakoffii** was found at the Hierra Waterfalls, about 40 km. from the City of Moyobamba, Dept. of San Martin, Peru.

which turned out to be new to science. He has requested that it be named in honor of Mr. Aleek Korsakoff of Jacksonville, Florida.

The plant was found at an altitude of 1500 meters in deep shade at the base and sides of the banks by the waterfalls named Hierra, about 40 km. by foot from the city of Moyobamba in the Department of San Martin, Peru. (see Figs. 37 and 38). The bulbs were found growing in peaty soil or leaf mold in soft areas with good drainage usually between cracks in large rock formations on sides of cliffs.

Fig. 38. **Left**, Hierra Waterfalls, where **Eucharis korsakoffii** was found by Lee Moore; **right**, Handful of the new species held by Lee Moore, after they were pulled from crevices in the rocks, about 40 km. from the City of Moyobamba, Peru.

Mr. Moore sent the bulbs to Mr. Aleek Korsakoff at Jacksonville, Florida, and to Mr. J. N. Giridlian, at Arcadia, California. Mr. Giridlian flowered it and sent a living specimen in flower to the writer. This was mounted as the holonomenifer (name bearer) specimen. The species has been named in honor of Mr. Aleek Korsakoff, the well-known plant enthusiast.

Eucharis korsakoffii Traub, **sp. nov.** Amaryllidac.

A E. fosteri laminis foliorum latioribus, per umbella plus floribus,

pedicellis longioribus, et tubo tepalorum breviore praecipue recedit. Habitat in Peruvia.

Bulb globose, 3 cm. long, 3.2 cm. in diam. *Leaves* petiolate, thick in texture. petioles slender, 5—10—15 cm. long; blades elliptic, 11—12—14.5—17.5 cm. long; 3.5—4—4.4—5 cm. wide, thick in texture. *Scape*

Fig. 39. Flower umbel of **Eucharis korsakoffii** Traub in its native habitat in Peru. Photo by Lee Moore.

up to 28 cm. long, slender. *Spathe* lanceolate, 2.5 cm. long. *Umbel* 11-flowered; flowers pure white. *Pedicels* slender, 4.4—4.6—5 cm. long at anthesis. *Ovary* 5 mm. long, 4 mm. in diam.; ovules about 3 per locule. *Tepaltube* 6 mm. long. *Tepalsegs* oblong, 1.8 cm. long, 6—8 mm. wide. *Stamens* 1.1 cm. long; anthers 4 mm. long. *Style* 2 cm. long, stigma trifid.

HOLONOMENIFER (name bearer): J. N. Giridlian s.n. = No. 1060 (TRA), cult. Arcadia, Calif., 7-16-66, from bulbs collected by Lee Moore at the Hierra waterfalls, about 40 km. from the City of Moyobamba, Dept. of San Martin, Peru.

Notes.—This species is related to *Eucharis fosteri* and is of interest to those interested in breeding the smaller statured *Eucharis*.

SUBSECTION **MEXICANAE** OF SECTION **AMERALLIUM**, GENUS **ALLIUM L.**

HAMILTON P. TRAUB

Of the *Allium* species native to Texas, New Mexico and Arizona in which the bulbs *are not* inclosed in a persistent reticulum of fibers, but have thin membranous coats with sparse vertical veins, only (a) *Allium cernuum*—of the *Cernuae Alliance*—with white or pink flowers, and *conspicuously* 6-crested ovaries; and (b) *Allium kunthii (longifolium)*, *A.* glandulosum (and possibly *A. rhizomatum*)—of the *Kunthii* (longifolium) Alliance *—are reported as extending their ranges into Mexico. Thus, newly collected *Allium* species in the border area and in Mexico not agreeing with the four species mentioned, would be examined as to their status as possible additions to the two Alliances indicated, or possibly to other Alliances.

Thus matters stood when Dr. T. M. Howard started collecting *Allium* species in 1957 in the U. S.—Mexican border area, and also in Mexico, and more recently also into Guatemala. Of the 15 lots collected by Dr. Howard prior to 1967, ranging from southwestern Edwards County, Texas, to Nueva Leon, Durango, Hidalgo, Mexico State, Michoacan, Jalisco, San Luis Potosi, and southwestern Guatemala, one was identified as *Allium glandulosum* (Hidalgo), one from Michoacan, etc., as *A. kunthii (longifolium)*, four proved to be new to science, and others remain to be identified.

On the basis of the study of living material whenever possible, this brief review of the Subsection *Mexicanae* of the Section *Amerallium*, genus *Allium* L., is presented.

For the second subsection—Subsect. II. *Canadensae*—including 11 species, the reader is referred to the comprehensive treatise by Ownbey & Aase (1951; 1959).

It is of interest to note, that in his extensive exploring trips south of the border, Dr. Howard has observed that "These are mainly summer and fall blooming. Some grow well in fairly wet places (due to frequent rains) but always where drainage is good. Others grow in nearly semi-arid country, but at good altitudes. I have never found them in tropical or semi-tropical low areas. They favor the plateau country. . . . The outstanding feature that impressed me is the bulb-bearing underground stems (rhizomes) produced by many of them. I had never seen this before in other Alliums that I have known."

The apparent affinities are tentatively indicated in the following key. Six of the eight species are described in detail. Two new species will be described later.

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* There is a probability that the epithet **kunthii** has to give way to **longifolium**, and for that reason this group is hereafter referred to as Subsection **Mexicanae**.

KEY TO THE SPECIES OF SUBSECTION **MEXICANAE**, SECTION **AMERALLIUM**, GENUS **ALLIUM**

1a. Bulbs coats thin, membranous, with vertical veins fairly widely spaced; ovary sometimes crested; species usually flowering in summer and autumn, rarely in spring:

SUBSECTION I. **MEXICANAE**

2a. Spring and early summer-flowering species:
3a. Spring-flowering species; umbel 10—30 flowered in March and April; flowers campanulate, tepals white or pinkish. Range.—Texas: e. Bexar and adjacent Wilson and Atacosa counties ....1. **elmendorfii**
3b. Early and mid-summer-flowering species:
4a. July-flowering; flowers pink Range.—s. w. Guatemala: s. of Huehuetenango (to be descr. later) .....2. **guatemalense**
4b. July-flowering; roots **coarse**, bulbs oblong; flowers lavender. Range.—Tamaulipas, Mex. (to be descr. later) ....3. **mexicanum**
2b. Late summer—and autumn-flowering species:
5a. Plants not robust; leaves several, relatively slender, tax:
6a. Bulbs not produced on long slender rhizomes:
7a. Plant glabrous throughout; August-September flowering; leaves light green, smooth; scape lateral, umbel centripetal, many-flowered; flowers white, tepals spreading. Range.—Texas: s.w. Edwards County, 5 mi. s.e. of Carta Valley .....4. **howardii**
7b. Leaves glaucescent, bulbs splitting in two vertically; scape central; umbel centripetal, 8—10—16—flowered; in October, flowers campanulate, light lavender, with deeper mid-vein. Range. —Nueva Leon: w. of Monterrey .....5. **traubii**
6b. Bulbs produced on long slender rhizomes; umbel few-fld in August; tepals pale, with purplish or pinkish mid-vein. Range.—New Mexico: Gila Hot Springs .....6. **rhizomatum**
5b. Plants relatively robust; leaves relatively longer, upright:
8a. Flowers in September-October, brownish red (mahogany); nectaries on ovary opposite the 3 petepals; tepals spreading. Range.—Central Mexico: Hidalgo: n. of Jacala, etc.; and southern Honduras .....7. **glandulosum**
8b. Leaves relatively longer, erect, thick, slightly concave in lower part, subterete in upper part; flowers in late autumn; umbel few-many-fld; flowers campanulate, tepals white or pink. Range.—Central Mexico: Michoacan; Mexico State & Jalisco, etc. .....8. **kunthii (longifolium)**

1b. Bulbs enclosed in a reticulum of fibers:

SUBSECTION II. **CANADENSE** Ownbey ex Traub

(For species nos. 9 through 19, see Ownbey & Aase, Res. Stud. State Coll. Wash. 23(4). 1955; and Rhodora 61: 70-71. 1959.)

Section I. AMERALLIUM Traub, **sect. nov.**

Vestimentis bulbi tenuibus membranaceis, venis aliquot verticalibus ornatis, vel vestimentis bulbi reticulo fibroso persistenti ornatis; ovario interdum cristato. Species vernali vel aestivali vel autumno florentes.

Bulb-coats thin, membranous with some vertical veins, or bulb-coats with a persistent reticulum of fibers; ovary sometimes crested; species flowering in spring, or summer, or autumn. Type: *Allium canadense* L.

Subsection I. MEXICANAE

Vestimentis bulbi tenuibus membranaceis, venis verticalibus aliquantum late dispositis ornatis; ovario interdum cristato. Species vernali vel aestivali vel autumno florentes.

Bulb-coats thin, membranous, with vertical veins fairly widely spaced; ovary sometimes crested; species flowering in spring, or summer, or autumn.

1. Allium elmendorfii M. E. Jones ex Ownbey, in Res. Stud. State Coll. Wash. 18: 218—219. 1950; "*Allium elemendorfii*" M. E. Jones, in Contrib. West Bot. No. 18, p. 20, 1935, *anglice*.

nf.: M. E. Jones 29071 (P), Bexar County, Texas, Apr. 3 (= Apr. 1). 1932.

Bulb ovoid, bearing a few short-stalked basal bulblets, innermost coats whitish, the cells of the inner epidermis vertically elongate or contorted, with very sinuous walls, outer coats (tunics) thin, membranous, without persistent fibers, fleshy bulb-scale 1, mildly garlic-flavored. *Leaves* 3 or more per bulb, channeled, concave-convex in cross-section, 1—2 mm. wide, entire, equaling or exceeding the scape in length, green at anthesis. *Scape* 15—40 cm. long, terete or nearly so, sometimes two produced successively from a single bulb. *Spathe* membranous, acuminate, breaking before anthesis into 3 or 4 ovate, acuminate, 3—5 nerved, separate or partially united valves. *Umbel* 10—30-flowered, erect. *Pedicels* usually more than twice as long as the perigone, elongating in fruit, becoming subequal in length, rigid, and somewhat flexuous. *Perigone* campanulate, *tepals* about 5 mm. long, lanceolate, obtuse, entire or nearly so, somewhat spreading, white or pinkish, withering away from the fruit, with the midribs slightly thickened. *Stamens* shorter than the perigone, *filaments* subulate, dilated below and united into a staminal cup at the base, *anthers* oblong, obtuse. *Ovary* crestless, *style* linear about as long as the filaments; *stigma* entire or distinctly lobed. *Seeds* black, shining, finely alveolate, alveoli smooth.

Range.—Endemic to Texas, collected only on the Carrizo Sands of eastern Bexar and adjacent Wilson and Atascosa counties.

Notes.—Flowering in March and early April. Easily distinguished from *A. kunthii* and *A. glandulosum* by the cluster of stipitate bulblets at the base of the main bulb, and by the very sinuous walls of the cells of the inner epidermis of the innermost bulb coats. When these are replaced and forced outward by the growth of the bulb, these "cellular reticulations" are then found on the now dead outer coats. *A. elmendorfii* in some respects also resembles *A. runyonii* of subsection *Canadenses*.

2. Allium guatemalense (to be described later); July blooming; flowers pink. Range.—s. of Huehuetenango, s. w. Guatemala.

3. Allium mexicanum (to be described later). Range.—vicinity of Marcello & Hermosa, Tamaulipas, Mex.

4. Allium howardii Traub, *sp. nov.*

Bulbo ovoideo 2.2 cm. longo, 1.4 cm. diametro, tunicis membranaceis; foliis deorsum vaginatis, partibus liberis 4—6 linearibus acutis 14.5—18 cm. longis 2—3 mm. latis glabris pallide viridibus laevibus; scapo laterali; spatha monophylla; umbella multiflora; floribus albis umbellam compactam centripetlaem conficientibus; pedicellis usque ad 1.2 cm. longis; segmentis tepalorum 9 mm. longis 3 mm. latis patentibus; staminibus 7 mm. longis; filamentis subulatis; ovario 3-lobato minute 3-cristellato, cristulis pallide viridibus; ovulis per loculam 2. Type: Traub No. 1058 (TRA), cult. from bulbs collected by Dr. T. M. Howard in s. w. Edwards County, Texas.

Bulb ovoid, 2.2 cm. long, 1.4 cm. in diam., tunics white, with vertical veins rather widely spaced, membranous. *Leaves* sheathing below for 4.5 cm., (only 1.3 cm. above ground) forming a pseudo-stem 3 mm. in diam. slender; free portions of the leaves 4—6, linear, acute, in a lax cluster, 14.5—17—18 cm. long, 2—3 mm. wide, glabrous, light green, smooth, slightly concave to almost flat in upper part, rounded below. *Scape* lateral, up to 37.5 cm. long (above ground), somewhat flattened, 2 x 2.7 mm. in diam., light green. *Spathe* monophyllous, white, membranous, rupturing to one side by the pressure from the expanding flower buds, 1.5 cm. long. *Umbel* many-flowered, in a centripetal compact umbel, flowers open 1, 2 or a few at a time over a period of a few weeks, flowers are pure white, except for three minute greenish crests on the ovary; pollen is cream-colored; tepalsegs are spreading (patent). *Pedicels* up to 1.2 cm. long at anthesis, slender, green. *Tepalsegs* 9 mm. long, 3 mm. wide; setsegs lanceolate, acute; petsegs oblong, acute; shriveling after anthesis. *Stamens* 7 mm. long, filaments subulate below; anthers 1 mm. long at anthesis, introrse, versatile, pollen cream-colored. *Ovary* 3-lobed, 2.5 mm. long, 2.5 mm. in diam., white, except for 3 minute light green crests on the ovary; ovules 2 per locule; nectaries are in cavities at the base between the 3 inner stamen-filaments and the ovary, but the nectar is not visible. *Style* white, shorter than the stamens at first, later slightly overtopping the stamens after anthesis. Anthers and the stigma do not mature at the same time (= dichogamy); anthers dehisce within the first 12 hours after flowers open, when style is 1—1.5 mm. long; after anthesis, the style elongates to 4 mm., slightly longer than the stamens. At La Jolla, Calif., the pollen is transferred by the beautiful insect, a solitary bee, *Agapostemon* sp. (identified by Dr. A. F. X. Williams, San Diego Natural History Museum), which extends its tongue into the nectary cavities, and in walking over the compact umbel, pollinates the flowers. Stigma capitate, minute. *Capsule* trigonous, obscurely 3-crested on top; (fresh) seeds black, angular, 3.5 mm. long, 2—2.5 mm. in diam.

Range.—Southwestern part of Edwards County, Texas.

5. Allium traubii T. M. Howard, in Plant Life 23: 62. 1967.

Nf.: T. M. Howard, s. n. (TRA 1061), cult. San Antonio, Tex., Nov. 18, 1966, grown from bulbs collected by Dr. Howard in the Mountains in the vicinity of Monterrey, Mex.

Bulb oblong, 2 cm. long, 1.2 cm. in diam., bulb-neck 2.2 cm. long, 4 mm. in diam.; outer tunics membranous, dark brown; bulb splitting

into two bulbs. *Leaves* sheathing below to 5 cm., free portions 11—14—15—17—18—19 cm. long, 2.5 mm. in diam. (up to 2.75 mm. wide under culture), glaucescent, concave, above, 3-ridged, prominently so under culture, on the back, apex acute. *Scape* subterete, 23.5 cm. long, 1.5 mm. in diam. *Spathe* lanceolate, whitish, 9.5 mm. long, rupturing to one side by the pressure of the expanding pedicels and flower buds. *Umbel* 8—10—16-flowered; flowers campanulate, very pale lavender (almost white), with deeper mid-vein, changing to lavender, with deeper lavender mid-vein, after anthesis. *Pedicels* 1—1.1—1.2 cm. long at anthesis, slender. *Tepals* lanceolate, acute, 6.5 mm. long, 2.75 mm. wide, shriveling and conniving in fruit. *Stamens* slightly shorter than the tepals; anthers 1 mm. long, introrse, versatile, pollen very pale lavender. *Ovary* white, 2 mm. long, 2.5 mm. in diam.; *style* white, 4.5 mm. long, stigma minute.

Range.—Mexico, State of Nueva Leon, in the mountains in the vicinity of Monterrey.

Notes,—Collected by Dr. T. M. Howard. Differs from *A. howardii* in its glaucescent leaves, 3-ridged on the back, later flowering season (November), fewer-flowered umbel, campanulate light lavender flowers, absence of ovary crests, and other features.

6. Allium rhizomatum Wooton & Standley, in Contr. U. S. Nat. Herb. 16: 114. 1913.

Nf.: E. O. Wooton (U. S. Nat. Herb. No. 690251, US), collected at the Gila Hot Springs, New Mexico, Aug. 20, 1900. Transition Zone.

Plant about 20 cm. high. *Bulb* ovate, about 1 cm. in diam., the outer coats grayish and opaque, the inner white and hyaline, with a few indistinct vertical nerves but not reticulate; the bulbs arising from slender scaly rhizomes, 2—3 cm. long. *Leaves* 2—3 mm. wide, much broader and clasping at the base, very finely serrulate. *Scape* terete. *Spathe-valves* 2, broadly ovate, scarious, at first pinkish-veined, becoming reflexed and white. *Umbel* few-flowered, erect. *Pedicels* (in young umbels) 1 cm. long or less. *Flowers* small for the genus, *tepals* oblong to oblanceolate, acute, 6—8 mm. long, pale with purplish or pinkish mid-vein, slightly carinate at the base. *Stamens* subequaling the tepals, included; *filaments* dilated at the base and forming a staminal cup. *Stigma* simple; *ovary* slightly crested.

Range.—New Mexico: Gila Hot Springs. Transition Zone.

Notes.—Wooton in a personal communication (Nov. 20, 1944) to the writer, stated that *Allium rhizomatum* is "very conspicuously different" from all material of *Allium glandulosum* Link & Otto that the authors of the species have seen. The present writer has verified this statement on the basis of herbarium studies.

7. Allium glandulosum Link & Otto, Ic. Pl. Rar. Hort. Berol. 1: 33, pl. 17. 1841; Ownbey, Res. Stud. State Coll. Wash. 15: 224-225. 1947; 18: 219-220. 1950.

Syn.—"Allium longifolium Lindl." (misapplied name), in Bot. Reg. 12: pl. 1031. 1826-27, non (H.B.K.) Humboldt, 1835.

Plant robust. *Bulb* obovoid, 1.5 cm. long, 1.1. cm. in diam.; tunics white, thin, membranous, vertical veins rather far apart. *Leaves* sheathing below up to 6.5—8.5 cm., forming a deciduous pseudo-stem, 6—8 mm. in diam., reddish; *free leaf portions* 4—5, upright, 24—28—30 cm. long, 4.5—6 mm. wide in lower part, glaucescent, green, deeply concave in lower ½ to ¾, sometimes nearly flat above, apex bluntly acute. *Scape* central, up to 50 cm. long, stout, deep green, slightly flattened, 4.5x6 mm. in diam., with prominent edges, narrowing gradually to the apex, 1.5x2 mm. in diam., apparently functioning as a photosynthetic organ as leaves somewhat decline; often a second smaller scape, also central, up to 30—40 cm. long, 2.5x3 mm. in diam., arises alongside the same scape, supporting a somewhat smaller umbel with fewer flowers. *Spathe* monophyllous, closed, white, membranous, 2.2 cm. long, lanceolate, soon rupturing due to the pressure of the expanding pedicellate flower buds. *Umbel* many-flowered (approx. 40—45-flowered), centripetal, second umbel, if present, with fewer flowers (approx. 22—25), umbels lax, 1, 2 or a few flowers opening in succession, mostly bending downwards below the umbel-base in fruit; flowers brownish-red (mahogany), tepals spreading (patent), moderately perfumed. *Pedicels* 2—2.2 cm. long at anthesis, slender, elongating somewhat after anthesis. *Tepals: setepals* almost linear, acute, 7.5 mm. long, 2.5 mm. wide; *petepals* elliptic, bluntly acute, 7.5 mm. long, 3 mm. wide, with deeper shining mahogany coloring near the base; tepals shriveling and conniving in fruit. *Stamens* 5 mm. long, subulate, united into a very short staminal cup; stamens slightly shorter than the tepals, bending outwards; *anthers* 1 mm. long, introrse, versatile, pollen ash-gray. *Ovary* conical, 2 mm. long, a nectar gland (circular opening) on ovary less than half way up on ovary wall opposite each of the 3 petepals; nectaries exude large globules of nectar (when absorbed with blotting paper, the nectar gradually reappears; no pollen carrying insects were observed during the day, and thus apparently the perfume may induce insects to visit the flowers at night); style 1—1.5 mm. long at anthesis, elongating to 4 mm. long after anthesis (style matures after anthesis = dichogamy); stigma pointed. *Capsule* trigonous, 4.5 mm. long, 5.5 mm. in diam.; seeds black, angular, 2 mm. long, 1.5 mm. in diam.

Range.—Central Mexico; recently re-collected in the State of Hidalgo by Dr. Howard; and southern Honduras.

Notes:—*Allium glandulosum* ranks among the most distinct species in the genus, and could not possibly be confused with any other. It is a robust plant with strong green scapes which take over the photosynthetic function when the leaves decline and gradually fall away after the flowers fade. The flowers are brownish-red (mahogany) numerous in the umbel with relatively long pedicels; the tepals are spreading; the ovary, and seeds are relatively small. The flowering season at La Jolla was relatively long (from mid-September to the end of October). It differs in these and still other features from its nearest relative, *A. kunthii (longifolium)*.

When the above description was taken down, the presence of rhizomes had not been verified in *A. glandulosum*. After the seeds were harvested in late November, the underground parts were studied, and this revealed *robust, smooth* white rhizomes which are entirely different from the *slender, scaly* rhizomes in *A. rhizomatum*. This definitely validates the latter species which is also characterized by a smaller, slender plant. In *A. glandulosum*, the *stout, green* scapes that carry on *photosynthetic activity*, and which persist after the leaves have been shed, apparently provide the food needed for the full development of the stout rhizomes.

When the spathe ruptures, the lower circle of pedicels are free, but above these there are at least two bundles of pedicels with short, white membranous sheaths at the base. These and the spathe more or less disintegrate by the time the seeds ripen.

Recent specimens: A Molino R. (Standley Herb. 14615 = 2445403 US), 8-14-64; between Las Pacayas y El Frijolar. Dept. El Paraiso, Honduras; Traub n. 1062 TRA, 10-29-66, cult. La Jolla, Calif., from bulbs collected by T. M. Howard, Hidalgo, Mex.

8. Allium kunthii G. Don, Mem. Wern. Soc. 6: 82. 1827; Morton Herbertia 7: 73. 1940 (1941); Ownbey, Res. Stud. State Coll. Wash. 18: 221—222. 1950 (1951).

Syn.—*Schoenoprasum lineare* H.B.K., Nov. Gen. et Sp. 1: 277. 1816, non *Allium lineare* L., Sp. Pl. 295. 1753; (between Santa Cruz de la Sierra and Mt. El Gigante, alt. 1300 hex.; September-flowering); *Schoenoprasum longifolium* H.B.K., Nov. Gen. et Sp. 1: 277. 1816; (Queretaro State: Arroyozarco and San Juan del Rio, alt. 1015 hex.; August-flowering); *Allium longifolium* (H.B.K.) Humboldt, in Sprengel, Syst. Veg. 2: 38. 1835; *Allium scaposum* Benth. Pl. Hartweg. 26. 1840.

Bulb ovate to subglobose, about 2 cm. in diam., tunics thin, membranous, with vertical veins fairly widely apart. *Leaves* sheathing below to 8—15 cm. forming a sheathing stem 6 mm. in diam. (5—12 cm. of the sheathing stem is above ground), usually somewhat reddish; free portions of leaves 3—5, 24—29—32—43—46 cm. long, 3.5—4 mm. in diam., concave on upper side to ¾ of its length, subterete above; deep green, acute. *Scape* 15—30 cm. long, terete or somewhat ridged, often 2 or more produced successively from a single bulb. *Spathe* membranous, acuminate, rupturing by the pressure of the developing pedicels and flower buds. *Umbel* 8—15-flowered. *Pedicels* unequal in length, about twice as long as the perigone, rarely arcuate or flexuous. *Perigone* broadly campanulate, tepals 4—8 mm. long, lanceolate, acute or acuminate, white keeled reddish, withering in fruit. *Stamens* shorter than the perigone, filaments broadly dilated below and united into a staminal cup at the base, anthers oblong, obtuse. *Ovary* crestless; *style* linear, shorter than the perigone, *stigma* capitate, entire. *Seeds* dull black.

Range.—Mexico: central region. Recently re-collected in the state of Michoacan by Dr. T. M. Howard.

Notes.—Markedly different from *A. glandulosum* which has wider, not subterete leaves in the upper part; and the flowers are totally different.

The 1 very short, or 2 longer rhizomes with a bulb at each apex, observed in *A. kunthii*, are similar to the 4 long rhizomes produced in *A. glandulosum*.

Subsection II. **CANADENSAE** Ownbey ex Traub, **subsect. nov.**

Bulbis reticulo fibroso persistenti obtectis; ovario interdum cristato.

Bulbs inclosed in a persistent reticulum of fibers; ovary sometimes crested. Type: *Allium canadense* L.

For species nos. 9 through 19, see Ownbey & Aase, Res. Stud. State Coll. Wash. 23(4): 1955, and Rhodora 61: 70-71. 1959.

TRAUB—SUBSECTION **MEXICANAE**, continued on page 110.

PLANT LIFE LIBRARY—continued from page 33.

PRIMROSES AND SPRING, by Doretta Klaber. Wm. Morrow & Co., 425 Park Av. S., New York 16, N. Y. 1966. Pp. 125. Illus. $3.50. This new book on primroses contains notes for beginners; popular descriptions of European mountain primulas and Asian woodland Candelabra and other bog primroses; primulas for specialists; and growing primroses from seeds. Recommended to all interested in primroses.

RESIN AND GLASS ARTCRAFT FOR FLOWER ARRANGERS AND CRAFTSMEN, by Laura Smith. Wm. Morrow & Co., 425 Park Av. S., New York 16, N. Y. 1966. Pp. 115. Illus. $4.95. This new book is designed to instruct both advanced artists and beginning craftsmen in the art of making resin and glass mosaics, and other colorful objects from the materials. Highly recommended.

ISLAND LIFE, by Sherwin Carlquist. Doubleday & Co., 277 Park Av., New York, N. Y. 10017. 1965. Pp. 451. Illus. $9.95. Subtitled "A Natural History of the Islands of the World", this stimulating, profusely illustrated book is concerned with the organisms that reach and evolve under the special, isolated habitat conditions of islands, and this provides the unifying theme. The rest of the book is concerned with particular examples of island life. This book is required reading for all biologists and is highly recommended.

PLANT PATENTS WITH COMMON NAMES, 1965 SUPPLEMENT 2465 THROUGH 2584. Publ. by the Amer. Assoc. of Nurserymen, 835 Southern Bldg., Washington, D. C. 20005. Pp. 7. $0.50. This is a supplement to the listings of plant patents previously published. The subject matter is arranged under three parts: I. Numerical listings; II. Alphabetical listing under common names; III. Alphabetical listing of names and addresses of originators or discoverers and assignees.

ELSEVIER'S LEXICON OF PLANT PESTS AND DISEASES, compiled by Manuel Merino-Rodriguez. Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1966. Pp. 351. Illus. $16.50. Using Latin as the basic language, the author has compiled a comprehensive number of vernacular names in English, French, Spanish, Italian and German. In Part I, the basic tables are arranged alphabetically within each section according to the Latin name of the living form together with the common name in the other languages. Part II comprises separate cross-keyed indices for each of the languages included in the basic table. This comprehensive lexicon is recommended to all plant pathologists.

BIOLOGY, ITS PRINCIPLES AND IMPLICATIONS, 2nd. ed. by Garrett Hardin. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1966. Pp. 771. Illus. $9.50. This 2nd edition of a stimulating, up-to-date introduction to biology will be welcomed by all biologists. The five parts of the text are concerned with life at the cellular level; equilibria, ecology and evolution; our plant-dependent world, the animal way of life, and heredity. Highly recommended to all students of biology.

FLORA OF JAPAN (IN ENGLISH), by Jisaburo Ohwi; edited by F. G. Meyer and E. H. Walker. Smithsonian Institution, Washington, D. C. 20560. 1965. Pp. 1067. Illus. $25.00. This enlarged and revised English translation of Ohwi's "Flora of Japan" (in Japanese), represents a comprehensive lineagic treatment of the approximately 4,500 species and varieties of plants and ferns of Japan, from Hokkaido to Kyushu, including descriptions and keys to all families, genera and species with their habitats and distribution. This fine English edition represents the first flora of Japan in any western language since 1879, and thus is indispensable to all interested in flowering plants and ferns. Highly recommended.

PLANT BIOCHEMISTRY, edited by James Bonner and J. E. Varner. Academic Press, 111 Fifth Av., New York, N. Y. 10003, 1966. Pp. 1054. Illus. $19.00. This up-to-date book on the biological activities of plants, incorporating contributions from a large number of outstanding authorities, is designed for both students and professional workers in the plant sciences. The five parts are concerned with the plant cell, its substructures and subfunctions; basic metabolism; control; and autotrophy. This stimulating book is recommended to all plant scientists.

SYMBIOSIS; ITS PHYSICAL AND BIOLOGICAL SIGNIFICANCE, edited by S. Mark Henry. Vol. I. Academic Press, 111 Fifth Av., New York, N. Y. 10003. 1966. Pp. 478. Illus. $16.50. This comprehensive first volume, incorporating contributions from nine outstanding authorities, is concerned with symbiotic relationships involving microorganisms, plants, and marine organisms. The subjects covered include intermicrobial symbiosis; lichens; bacterial symbiosis with plants; mycorrhiza and other plant symbioses; symbiosis in marine organisms; cleaning symbiosis in the marine environment; and experimental analysis of behavior in symbioses. Highly recommended to all biologists.

THE ORIGIN OF CULTIVATED PLANTS, by Franz Schwanitz. Harvard University Press, 79 Garden St., Cambridge, Mass. 02138. 1966. Pp. 175. Illus. $4.75. This translation by Gerd von Whalert, from the German edition of 1957, will be welcomed by plant biologists. The author first explains the differences between wild and cultivated plants; and then discusses the genetic bases of the origin of cultivated forms. After considering the influence of the environment on the origin of cultivated plants, he concludes with a history of the science of plant breeding, which he characterizes as an evolutionary process guided by man. This stimulating book is very highly recommended to plant breeders and plant biologists generally.

LIBERTY HYDE BAILEY, by Andrew D. Rodgers III. Hafner Publ. Co., 31 East 10th St., New York, N. Y. 10003. Facsimile Reprint, 1965. Pp. 506. Illus. $10.00. This facsimile reprint of the 1949 edition of the biography of Liberty Hyde Bailey will be welcomed by biologists generally. This is not the usual biography. Here the life and work of this outstanding pioneer scientist are presented in the context of the development of the plant sciences and other sciences related to agriculture, in the United States and Canada. This is summed up as "A Story of American Plant Sciences" in the subtitle. Dr. Bailey's contributions to plant lineagics and cultivated plants is emphasized. This is a book that belongs in the library of every biologist. Very highly recommended.

3. GENETICS AND BREEDING

A YEAR OF ANTICIPATION

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The past year for the writer has been a year of anticipation. Moving to California required adjustments that had to be made, but it also brought new friendships, and opened up new sources of breeding material. As a result, he is now looking forward to some beautiful surprises in the form of new Amaryllis hybrids within the next few years.

Since moving from Colorado to the coastal area of Southern California, a number of problems have been encountered. The soil being so different, and the dried cow manure on the market reputed to contain much salt, it was necessary to decide upon a new potting mixture, which has required considerable experimentation. Having always grown Amaryllis in pots, it was decided to continue doing so, but without the benefit of a greenhouse. From personal observation, however, it was soon evident that Amaryllis would do better with some protection from the sun in summer and from the low temperatures on the colder nights in winter. These problems have been at least partially solved recently by constructing benches along the east side of the house, on which the potted bulbs are placed. These benches have a plastic windbreak on three sides and a hood over them, which is composed of plastic and some shading material such as screen wire. Beneficial results from this protection are already evident. The writer had very little trouble with the red blotch fungus disease of Amaryliss in Colorado, but it seems to be quite prevalent this year in California. It is hoped that these hoods over the Amaryllis, by reducing the amount of cold moisture condensing upon the plants at night, will improve this situation. Although growing Amaryllis in pots on benches may limit somewhat the number of bulbs grown, and a real freeze would have serious consequences, nevertheless there are some advantages to this method. There is no need to get down on the ground to work with the bulbs, there is no struggle with weeds, and the numerous giant snails here in California have given no trouble at all.

The past year has been one of making new friends who are also interested in growing Amaryllis. The writer promptly joined the Southern California Hemerocallis and Amaryllis Society, and has received much in the way of inspiration and help from this local society. Anyone interested in Amaryllis is urged to join a local society if at all possible, for having lived many years in a region where no such organization existed, the writer can testify to the value of one. Several members of this local society have been of considerable assistance to him in his search for breeding material, exchanging mature bulbs, seedlings, seed, and pollen with him. This pollen for example, has

enabled him to make a number of very interesting crosses, such as a Striata hybrid crossed with a Calyptrata hybrid.

Because of our move to California in the middle of last year's growing season, very little has bloomed so far this year, but much new material has been acquired for future hybridizing work. More than twenty additions have been made to the writer's collection of species and direct crosses with species, much of this being from new friends in the local Amaryllis society. This collection now includes twenty-five different species or varieties of species. The direct crosses, having at least one species for a parent, involve the following species: striata (possibly seven different forms of this species), psittacina, vittata, immaculata, calyptrata, evansiae, aulica var., platypetala, belladonna var. haywardii, aglaiae, pardina, reginae (identity of the last two is questionable), and two unidentified species. Much of this material is not yet of blooming size; so the next few years should be very interesting. It might also be noted that some unusual Dutch hybrids have been secured from a local florist who imports his seed from Holland and raises hundreds of Amaryllis yearly. One such was a white with a pronounced yellow tinge, and another was very close to being a true purple. One of the Amaryllis Society members had a hybrid between A. evansiae and A. galaiae in bloom when this yellowish white bulb was secured, it also being in bloom, and the two were cross-pollinated, but without any success.

The primary objective of the writer's breeding program is to develop a recurrent-blooming type of Amaryllis. All of his Striata crosses have been made with this end in view, and the keeping of careful records has revealed that several of these Striata hybrids are dependable recurrent bloomers. One of these is a rather striking red orange of graceful form, which has been used extensively in further crosses. Other recurrent-blooming Striata hybrids have been received from friends in the past year. In addition, the Hadeco clone TANGERINE, and an unnamed Indian miniature hybrid, have also proven to be definite recurrent bloomers. From the reports of friends, it is also likely that a number of recent Dutch hybrids may be recurrent bloomers.

A secondary objective is to develop more summer or fall-blooming hybrids, and some of this new material is directed towards this goal. Through the kindness of Dr. Traub, the early hybrid Amaryllis x acramannii was secured, but it has not yet bloomed for me. From R. D. Goedert was secured a hybrid of A. aulica var. platypetala; this bloomed in September of 1965 for the first time. The flowers were about six inches in diameter, in color a rose red with deep red throat markings, and were held quite erect. The leaves have a definite purple cast to them. All crosses made with this hybrid ended in failure. However, it remained evergreen all winter, and a flower bud was just discovered coming along with new leaf growth as this article was being written in mid-June of 1966, which indicates that it will be a late summer bloomer. Perhaps this year a cross may be successful. Another summer bloomer has just been discovered among some Tunia Australian hybrids raised from seed. This bulb, a sparkling white, bloomed in July of 1965, and is going to bloom again this year about the same date.

From R. D. Goedert was also secured a bulb labeled LM 63-1, which may be A. reginae. This bloomed for the first time in August of 1965. The flowers were rather small, slightly less than four inches in diameter, and were a bright red with a small white star in the throat. Only one of the crosses made with it was successful, and this happened to be with another one of the writer's recurrent-blooming Striata hybrids, a cross between the Houdyshel orange scarlet hybrids and A. striata (reference was made to this cross in the 1966 Yearbook). Just now this LM 63-1 bulb is apparently going into a resting period for the first time; so it may bloom again in late summer. This past winter another Lee Moore bulb labeled PERU #10 was obtained from a member of the local Amaryllis Society, and it bloomed in February, 1966. The flower was very similar to that of LM 63-1, but the leaf growth so far seems to be somewhat different. None of the crosses made with this bulb were successful.

In conclusion, the writer wishes to offer a suggestion to all local Amaryllis societies. One member of the Southern California society has been searching the gardens of her neighbors, and has located several unusual Amaryllis. It is suggested that both hybrids and species believed to be lost or unavailable may actually be growing in some garden, particularly in the subtropical regions of this country, and local Amaryllis societies might do well to organize a search for such material. This could be one phase of a definite program set up by each local society, a program designed to encourage more society members to engage in hybridizing activities. In addition, a list should be compiled of all the species and important hybrids being grown by the members, and then whenever possible, offsets, seed, and pollen should be distributed as widely as possible among those interested. Such a program would certainly create new interest in any local society, and furnish years of anticipation for every member.

AN AMARYLLIS BREEDING PROJECT

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My interest in amaryllis goes back about eight years and resulted from my contacts with Prof. Claude Davis and the late Prof. Ira Nelson. Let me say that these contacts were most interesting and enjoyable and developed as a result of my interest in Louisiana irises, an interest that is still carried on quite extensively.

Original efforts with amaryllis centered around the named Dutch hybrids and seedlings grown therefrom. All of these are grown outdoors as the winters in Baton Rouge are normally very mild. A fairly heavy mulch suffices to protect the bulbs even in exposed areas. The most noteworthy result from growing several hundred Dutch seedlings is a series of picotee whites derived from the cross "Nivalis" X "Apple Blossom". Some of these are exceptionally large and beautiful.

Although many beautiful seedlings can be obtained by crossing the named Dutch clones, the urge to produce something different won out and about 1960 I began a collection of amaryllis species. The objective was to use the species among themselves and with appropriate Dutch parents to produce forms and colors not otherwise available. This project has moved slowly but it is moving. Most of my species were obtained as small size or seedling bulbs and many are only now reaching blooming size. Then I was to learn of the frustrations of obtaining seed set with species compared to the relative ease of obtaining seed with the Dutch clones. The varied cultural requirements of the species present a real challenge and individual likes and dislikes vary widely. The following are some of my observations and experiences in growing the species.

A. Striata (Vars. *striata* and *fulgida*) and *A. belladonna* (from Bolivia and Brazil) were among my earlier acquisitions and have been good performers in pot culture. Pot culture is normally used for all my species. The pots remain outdoors from April thru October and are kept in a glassed-in patio during the winter. During the summer they get at least ½ day of sunlight and are fertilized with liquid fertilizer each month. These two species are now being tested in outdoor culture in protected areas. Seedlings derived from *A. striata* and *A. belladonna* with white Dutch clones are now 1-2 years old and are growing well.

It may be worthwhile to point out the technique I use for pollen storage. The pollen is placed in ½ ounce glass vials, labeled and stopped with cotton wadding. The vials are placed in a large mouth screw-cap jar in the bottom of which is placed about a ¾ inch layer of indicating "Drierite" (calcium sulfate dessicant available from chemical suppliers). The capped jar is stored on the lowest shelf of the refrigerator. As long as the "Drierite" remains blue it is good, when it turns pink it should be replaced. I have set seed with pollen stored for 5-6 months in this manner. The "Drierite" is a more convenient dessicant to use than zinc chloride and appears to be equivalent in performance.

A. evansiae was also acquired several years ago as a small bulb. The original bulb has bloomed for the last two years and several offsets have now reached blooming size. I have found that this species requires perfect drainage and must be watered only very sparingly during its period of rest in the winter. Excess moisture when *A. evansiae* is not in active growth is almost certain to cause rot. It seems to enjoy a good deal of moisture during its summer growing period. All attempts thus far to use *A. evansiae* as a pod or pollen parent have been unsuccessful.

The "Senorita" hybrids *(A. striata* X *A. evansiae)* developed by the late Prof. Ira Nelson are an outstanding group. Color and form are most unusual. Light pastel pink with creamy blush, or cream with a pink blush—words are not adequate to describe these delicate colors. The up-looking form accents the beauty of the "Senorita" hybrids. Pot culture is quite easy and the plants are vigorous growers and produce offsets freely. Some 200 or more one year old seedlings from

"Senorita" crossed with Dutch parents are ready to be set out in the spring. It will be interesting to see the colors and forms of these hybrids.

One highly prized species which I was fortunate to acquire is *A. pseudopardina*. This species was described by Dr. Cardenas in *Plant Life*, Vol. 21 (1965). The bulb was acquired in the fall of 1964 and potted in a 9" pot. It has grown very well for me and at this writing is in a state of semi-dormancy. It is treated about the same as *A. evansiae* with respect to watering. This may not be necessary but I don't want to take chances with rot. One small offset has formed and the bulb is about 2¾" in diameter (an estimated 50% increase in size in one growing season). I hope to see a bloom scape within the next month or two.

Acquisitions during the past year include *A. starkii*, *A. psittacina*, *A. aulica* (var. *platypetala*), *A. cybister*, *A. mollevilquensis*, and *A. umabisana*. Among this group only *A. aulica* has bloomed.

I also have several of the unidentified species imported by Mr. Goedert. Some *striata* and *belladonna* forms have bloomed. One merits special comment. This is a species obtained under number SA 63-20 (from Brazil), which bloomed in January, 1965. Three scapes had 4, 3 and 2 flowers. The flowers differ markedly from the description supplied by Mr. Goedert's collector. The scapes are quite tall (one was 33", the other two, 25" and 28") and the flower is almost 6" across. The color is light pink with orange veining and a green throat. All 9 flowers were pollinated and, quite remarkably, all set seed pods. Not all of the seed was viable. Good crops of seedlings were obtained from selfing and with the "Davis Hybrid" (*A. evansiae* X *A. agliae*) as the pollen parent. This plant appears to fit reasonably close to the description Mr. Goedert gives for his unidentified species SA 62-3 (*Plant Life*, Vol. 21, 1965, pg. 129), supposed to be *A. striata crocata*. However, my SA 63-20 has a capitate stigma and a rather inconspicuous paraperigone, indicating it may be a *belladonna* rather than a *striata*.

THE BRITISH NERINE SCENE

J. T. Gallagher, *England*

Even with the best stock available it is not long before the enthusiast is tempted to join the bees in giving nature a helping hand. Given an objective programme the chances of success with the breeding of nerines are high and amply repay the small amount of time and work involved.

My own bulbs began to flower quite early last Autumn and although I had planned out my crosses for some time beforehand, I must admit that I was only partially successful in completing my programme. One of the fascinating aspects of some of the crosses I have made so far is the variable number of seeds produced, especially when using hybrids with higher chromosome numbers. This was strikingly exhibited this season by the aneuploid 'Joan'. 'Mariloo' x 'Joan' yielded 125 large very uniform seeds, the reverse cross, 'Joan' x 'Mariloo' yielded only 40 seeds which were very variable in size. Using the pollen of 'Joan'

on the same number of flowers of an unnamed pale pink seedling from Exbury, which I believed to be a triploid, yielded 17 very large pale green seeds all of which have germinated. It will be some time before the results of these crosss will be known and I am beginning to realize the importance of keeping some notes to refresh one's memory!

My friend Mr. Smee of Ipswich in Suffolk wrote to me in great excitement to tell me of one of his new seedlings which had just come into flower for the first time. He had crossed 'King of the Belgians' with pollen from the old triploid 'Rotherside', one of the seedlings had very large flowers of great substance with the individual petals over 3¼" wide but spoilt by having a dirty puce colour and very erect pedicels. The flowers so large that Mr. Smee believes the seedling might be tetraploid, but it has not yet been possible to do a chromosome count to determine whether this is in fact the case.

Mr. Smee has developed a method of growing many of his bulbs in heated soil beds in his greenhouse. These are constructed with a base of concrete paving stones with concrete edging stones round the sides to give a depth of approximately nine inches and are filled with the normal soil mix used for growing nerines. The temperature of the soil is thermostatically controlled at 50°F. by means of electric heater cables and the air temperature in the greenhouse is maintained at 45°F. throughout the winter using a fan type heater. Bulbs are planted into the soil leaving the top third above the surface in the normal way. His results using this method are very remarkable both from the size and quality of the flowers and the rate at which the bulbs multiply. On the other side of the greenhouse other bulbs are grown in pots and although grown exceptionally well and convenient for exhibiting, the soil bed flowers are definitely superior. Perhaps his most fascinating nerine is a new white form of *Nerine bowdenii* recently imported from the Transkei which had a magnificent umbel of creamy white flowers on a 4' scape.

Sir Frederick Stern has been a nerine fanatic for many years as well as being a very distinguished amateur horticulturist. As a close friend of the late H. J. Elwes he obtained many of the latter's better hybrids and has been crossing these, and selecting out and growing on the better seedlings. He very kindly invited me down to Highdown, his famous garden at Worthing, Sussex, which is on the south coast about 60 miles from London. Sir Frederick is a pioneer of the application of scientific principles to planned breeding. Used on many of the plants in his own garden the results speak for themselves as it is hard to think of any grower who has won more major awards for so many different types of plants he has bred. It was under his chairmanship of the board of trustees that a separate department of cell biology and cytology was set up at the John Innes Horticultural Institute some years ago.

When I arrived we immediately went up to the greenhouse where Sir Frederick and Lady Stern were selecting the best seedlings for naming. Most exciting was a new pale orange seedling which was the result of a cross between 'Grilse' x 'Bonnerole'. It is best described as an

orange form of 'Roza Stevenson'. We decided that this wonderful new hybrid should be called 'Sybil' in honour of Lady Stern. Another lovely orange variety 'Gloaming' x 'Jewel' is to be called 'Highdown Orange'. Unfortunately I was too late to see 'Catherine' which flowers early and was given a Preliminary Commendation by the Royal Horticultural Society a week or two before.

I was most anxious to find out as much as I could about Mr. Elwes collection and was fascinated to learn that it was in fact quite small considering the number of excellent hybrids he had bred. Later, during a tour of the garden which is on pure chalk, Sir Frederick told me some of the stories behind the shrubs, many of which are still only known under the collector's numbers, and his experience with them over the years. Following interest after the publication of his book SNOWDROPS AND SNOWFLAKES, he received a large collection of *Galanthus* species from Soviet Russia for comparison and study. I left HIGHDOWN after tea with a present of bulbs of 'Wavell', 'Kenilworth' and 'Firecrest' safely packed in the boot of the car.

One of the more interesting events of the autumn followed the decision by Lady Clarke to auction surplus bulbs from the Borde Hill collection to help with the upkeep of the gardens. Unfortunately too many of the hybrids listed in the sale do not stand up to modern standards, but even so fetched good prices. It is to be hoped that with the great shortage of bulbs of nerine varieties, that purchasers will not be misled into under-estimating the superb qualities of modern nerines, as after all some of the bulbs being sold have been in cultivation for over 70 years and would, of course, be discarded in a modern seedling bed.

However, there were some nice things to be had for the discerning grower. 'Stephanie', one of my favourites, is a really lovely pale pink with smooth petals and very good umbel form. 'Timoshenko' a good strong red. One of the most interesting items, was a cross between *Nerine bowdenii* and *Brunsvigia rosea*, which has small flowers clearly exhibiting the white throat influence of the *Brunsvigia* in the cross. This was listed as "N. BELLADONNA var. MITHRAS", which must not be confused with the Exbury bulb 'Mithras', a pale pink variety with a deeper flushing, as there is no connection in the parentage. One outcome of this auction was the proposal to form a Nerine Society which has since been established as an independent body with Lady Clarke as President.

As we motored through the beautiful heath and woodland of the New Forest towards Exbury, I found it hard to guess what surprises would be flowering for the first time in this great collection. Miss Blackburn greeted me with a twinkle in her eye and sent me off to look for myself while she went to look for Mr. Wood who has been looking after the collection since it was first formed. On arriving at the greenhouse I was greeted by the most fabulous nerine I have ever seen, the twelve flowers were almost 4″ wide on 3″ pedicels and the peduncle was 20″ long carrying an umbel of over 8″ in diameter. One need hardly have looked at the label to know that this was a cross between 'King

of the Belgians' x 'Inchmery Kate'. The colour was a pale shell pink with a darker line down the centre of the petals, I could only stand and gaze at it in wonder as it glittered in the autumn sunlight. At last, glancing past, I saw another 'King of the Belgians' seedling, the ice white 'Vestal' sparkling above the other flowers at the end of the greenhouse. 'Carolside', deep salmon and exhibiting a slight tendency to erect pedicels inherited from its mother 'Rotherside'. 'Audrey' a 'Wellington Koo' seedling, rose pink flushed blue, named after Mrs. Wyniatt who now does all the crossing.

Another seedling 'Trafalga' x 'Inchmery Kate' was also flowering but it was difficult to tell how the final flower will look as this was not a typical example, even so the colour was a lovely cerise purple and the petals heavily waved. Of the older hybrids a batch of 'Dunkirk' were especially good. As Exbury have managed to cross this fine triploid with 'Inchmery Kate' it is surely only a matter of time before we will see the first nerine with five times the normal chromosome count.

As luck would have it the winder of my Starteck camera broke after I had taken only one photograph and as all the best flowers were picked by Mrs. Wyniatt the next day to decorate the table for a dinner party being given by Mr. Rothschild, I was unable to get it mended in time to photograph any more of the flowers.

Returning nearer to London a very good collection of modern hybrids has recently been presented to the Royal Horticultural Society by Mr. B. Smithers of Winchester. These bulbs are now growing at Wisley, Surrey, and I am very grateful to Mr. F. P. Knight, V.M.H., Director of the Society's gardens for giving me a complete list of these varieties.

Looking down the list one of the most interesting, 'Wellington Koo,' originated as an unknown seedling at Exbury and was responsible for many of the unusual blue shades which are appearing among the seedlings in that collection. This variety is no longer grown at Exbury and the Wisley bulbs are the only stock that I know of at the moment. Another interesting variety which I have only seen at Bodnant in North Wales is 'Jenny Wren' which is very free flowering, having very characteristic strap-like petals of cherry pink. Good whites are represented by 'Snowflake' and 'Hailstorm' which has flowered well for the last two years.

Any visitor to London in October should certainly try and visit Wisley, as apart from this excellent collection of nerines there is a very wide range of every other type of plant and shrub.

Lastly I am appealing to readers to write to me if they know of the existence of 'Alice' as the original stock has died and I have been unable to locate any enthusiast who is growing this variety at the present.

Graystead, Bovingdon,
Hertfordshire, England

ADVENTURES IN AMARYLLID BREEDING

CLARENCE J. CROCHET, *Route 1, Box 18, Prairieville, La. 70769*

For the past few years we have been hybridizing in several directions. Work with *Amaryllis, Crinum, Zephyranthes, Habranthus,* and *Rhodophiala bifida* and *Spathacea* continues. In the case of some groups, as in *Amaryllis,* the results have been quite satisfactory. In other groups, results are rather disappointing for several reasons. Perhaps the most prominent reason is that so much time will lapse from seed to mature, blooming size bulb. Another is that very often the weather situation is not ideal for the work at hand. Very often frequent rains will not allow pollen to dry in the open and hybridizing will be impossible as a result of this. On the other hand, excessive dryness in the atmosphere or in the soil increases the difficulties encountered by the hybridizer. As a result, hybridizing activity is curtailed. Often flowers which might be worked with on a particular day have deteriorated to the point that they cannot be used. An example of this is *Habranthus.* On very warm, humid days, the small and often fragile flowers last no longer than twenty-four hours. Therefore, one must be constantly alert to the opportunity for hybridizing, when it is presented. In the past, many times, flowers which we had waited to see in bloom completely eluded us because of their small or insignificant size. We have learned that a quick but thorough check of the flower beds every day leaves nothing to chance.

Pollen storing has greatly facilitated the work on our more recent projects. For storing pollen we use small glass vials. These are kept on the top shelf of the refrigerator, tightly closed, and with each vial marked with the name of the pollen parent. Using this procedure has made it possible to keep valuable pollens over a longer period of time.

Amaryllis species acquired from various sources have, as a whole, proved indifferent to our pot culture here. In many cases, they either did not grow and thrive in pots, or have only persisted through several years of effort at trying to provide them with optimum growth conditions. Consequently, we removed said bulbs from the pots early this spring and planted them directly in open beds. The soil in these beds had been improved by the addition of peat moss (Canadian sphagnum) and copious amounts of builders sand (coarse grade). The latter was to be a safeguard against our rainy climate and also a guarantee that the soil around the bulbs would quickly drain. The results were phenomenal. *Amaryllis* which showed no vigor or effort to grow previously have now taken hold and are growing vigorously for the first time. These species and species crosses will be removed and stored for the winter months in paper sacks. Next spring (1967) they will again be planted in open beds. The exception to this will be those bulbs which will bloom before that time. In this event, indoor potting will be necessary. An example of species which require winter potting are *A. striata fulgida,* which is dormant for only short periods. But they also will be planted in open beds early in the spring when the weather permits.

AMARYLLIS HYBRIDS

This group of bulbs presents by far the greatest amount of enjoyment of those mentioned not only because of their great beauty and varied colors, forms, sizes, and generally satisfactory performance, but also for their role in the development of hybrids of breathtaking beauty. The results with this group have been more than satisfactory and gratifying. With the advent of "pastel" hues, they are keeping in step with the times, and choices of color in the future will only be a matter of personal taste. At the present time one can see color ranges from the lightest and softest salmons, pinks, light oranges, purest whites, blazing scarlets, large flowered picotees whose edges are marked with fine pink or red lines, to the very darkest shades of red and violet red.

Fig. 40. Hybrid **Amaryllis**, very large red with completely reflexed tepalsegs, giving an almost round appearance, grown by C. J. Crochet.

For the last few years we have been carefully selecting those plants which we deemed to be outstanding in color, form, performance, sunfastness, uniqueness, and hybrid vigor. These individual bulbs have been segregated, numbered, and are being re-evaluated each year. From this group we plan to select, register, and introduce those which we consider outstanding. Outstanding is (1) a large white hybrid with brightest scarlet red "brushed" on, and with wide tepalsegs and green throat. The color contrast is most pronounced; (2) a very light salmon "pastel" colored flower with whitish throat and very wide floral parts.

This flower is very flat in form and all edges are ruffled; (3) a large white flower with all segments marked with "eyelashes" of scarlet red. All segments are also markedly imbricated; (4) a large white flower with all floral parts "washed" a light rose color at the tips; (5) a light colored salmon pink with "seersucker" texture; and (6) an orange red colored hybrid with very wide pure white band in the middle of all segments.

Our personal choice in amaryllis flower hybrid form has been the very imbricated "overlapping tepalseg" type, but even above this we value complete-reflexed tepalsegs. giving an almost round appearance (see Fig. 40). A very large red hybrid, with wide floral parts. An almost completely round form (see Fig. 41). Another oddity which has appeared in our hybrids is the red reflexed but angular form (see Fig. 41), reminding one of a hybiscus flower in full bloom.

Fig. 41. Hybrid **Amaryllis, left,** large red, almost completely round in form; **right,** showing the red reflexed angular form reminiscent of a **Hibiscus** flower. **Grown by C. J. Crochet.**

Outstanding are (a) *A. evansiae*, *A. evansiae* x 'Leading Lady,' a white Dutch hybrid, portraying vividly the contribution of both parents in the resulting hybrid; and (b) the second generation cross of *A. striata fulgida* x 'Five Star General' x 'Sight Show'. The resulting hybrid is of medium size and pink in color, having the short *A. striata* scape height.

CRINUMS

Work with crinums has been somewhat less rewarding than with amaryllis. We do hope however to progress slowly in the future. From many crosses involving *Crinum scabrum* we have selected one seedling which blooms later than the parent bulb and which shows a pink striped keel rather than the "wine" red of *scabrum*. Its value is in both its color and blooming period. Figure 42 shows this *Crinum* hybrid in

full bloom while the species *Crinum scabrum* is at lower right of the picture. Pollen from the light primrose yellow *Crinum luteolum* has also been used successfully in crosses with *Crinum scabrum* and the resulting seeds have been planted. The outcome of this cross will be awaited with great expectations and interest as we already see in our minds a yellow hybrid *Crinum* with the growing habits of *Crinum scabrum* and with the grace and beauty of *Crinum luteolum*.

Fig. 42. Wine red hybrid, involving **Crinum scabrum**, grown by C. J. Crochet, Prairieville, Louisiana.

ZEPHYRANTHEAE

In this group of little bulbs which bloom so often we have bloomed two new hybrids. The first of these involved Dr. Howard's "Apricot Queen" and *Z. citrina*, a reliable gold colored clone. The resulting hybrid was about 12 inches high and very dark yellow in color with brown lines on setsegs only. The other hybrid was more striking. It is from a cross of Dr. Howard's "Helen Wyatt" and "Kitty Clint". This cross produced a hybrid of pink color with white star in the center of flower parts. This combination of colors is very pleasing and delicate.

Habranthus and *Zephyranthes* of the subgenus *Cooperia* have also been used in hybridizing but none of the seedlings have bloomed yet. In this group of amaryllids are many interesting species and hybrids from Mrs. Morris Clint, Brownsville, Texas. She very generously added to the writer's collection of this little known and cultivated group of interesting bulbs.

RHODOPHIALA

The two species of *Rhodophiala (spathacea* and *bifida)* have also been used in hybridizing. The objective was to verify the cross *Rhodophiala* x *huntiana* which has been reported. The intermediate color will prove interesting in further hybridizing. From dozens of crosses came a very light pink hybrid as well as a rose colored one. Tepalsegs on

the hybrids were wider than usual. The types were to be photographed but unfortunately camera equipment was not available at this time. It is hoped that photographs can be made in the future and reproduced in Herbertia.

CRINUM X EBORACEI—'JUNE HARRIS'

L. S. Hannibal, *4008 Villa Court, Fair Oaks, California 95628*

Presumably about 1825 Dean William Herbert crossed *Crinum asiaticum* with *C. bulbispermum* (Then known as *C. capense album*) to effect his hybrid known as *C.* x *eboracei*. The fact that this hybrid or an allied one of *C. bulbispermum* x *pedunculatum* were free seeders and produced robust F-2 plants was of little significance at the time as little was known concerning the genetics of hybrids. Now it is quite a surprise to find that species from subgenera will cross and give fertile seedlings whereas species in the same subgenera are often quite incompatable.

The second record of *C.* x *eboracei* being produced is by the Reasoner brothers who established and operated the Royal Palms Nursery in Florida beginning some 80 years ago. To them goes much of the credit of intercrossing *C. bulbispermum album* with *C. asiaticum* (or *pedunculatum*), *C. americanum*, *C. kirkii*, *C. scabrum*, and *C. amabile*. The fact that most of these hybrids have been accepted as species by later horticulturalists in a fact well worth noting. However, according to the Reasoner catalogues their *C. cappedum* cross was a *pedunculatum* x *bulbispermum album*. L. H. Bailey identified it as *C.* x *eboracei* var. *cappedum*. In August 1966 this hybrid was apparently found. It had been growing in the garden of Ivy Powell. Eventually we will be able to compare it with *eboracei* hybrids as well as *pedunculatum* x *bulbispermum*.

Both the Reasoner and Herbert crosses had white flowers. Some ten years ago Charles Harris of Griffin, Georgia, crossed the *C. bulbispermum roseum* with pink blossoms on *C. asiaticum* (presumably *sinicum*) and obtained several clones of a free flowering pink, the best of which he named *C.* x *eboracei* 'June Harris' for his wife. This hybrid is quite hardy and will backcross to produce seed. The plant is nearly as tall as *C. asiaticum* but the foliage resembles that of a slender growing *Agave* more in shape as it is succulent, semierect and the leaves come to long tapered points. Blossoms may occur from May to October in Georgia. These are on 36 to 40 inch scapes, standing above the foliage and the florets stand erect with slender horizontally spreading tepalsegs. There is some similarity to the hybrid 'Twelve Apostles'. The fragrance is quite spicy. Fortunately the Harris bulb produces numerous offsets so it is possible to obtain a large clump within a few years. The fountain like foliage, numerous flower heads and lack of cluttered dead leaves make this plant an interesting garden subject.

The ability of *C. asiaticum*, *C. pedunculatum*, and *C. americanum* to cross with *C. bulbispermum* and *bulbispermum* hybrids has caused us to examine related plants. All are vigorous and show some level of

fertility. Crosses of *C. asiaticum* and *zeylanicum* have been reported in Calcutta gardens, and crosses between the dwarf Japanese *C. asiaticum* and South African Crinums have been effected by the writer. This group should be particularly hardy. A *C. asiaticum* x *C. americanum* hybrid apparently exists which bears considerable resemblance to a small *C. pedunculatum*, and a *C. americanum* x *C. amabile* was recently found by the late Ira Nelson. There are undoubtedly others but the scant information on unreported hybrids as well as reported gives us little means of evaluating the plants.

TRAUB: AMARYLLID NOTES, 1967—continued from page 69.

Allium canadense subsp. **mobilense** (Regel) Traub & Ownbey, **comb. nov.**, Syn.—**Allium mobilense** Regel, in Acta Horti Petrop. 3: 121. 1875.

Allium canadense subsp. **hyacinthoides** (Bush) Traub & Ownbey, **comb. nov.** Syn.—**Allium hyacinthoides** Bush, in Ann. Rept. Mo. Bot. Gard. 17: 119. 1906.

Allium canadense subsp. **lavendulare** (Bates) Traub & Ownbey, **comb. nov.** Syn.—**Allium lavendulare** Bates, in Am. Bot. 22: 58. 1916.

Allium canadense subsp. **ecristatum** (Jones) Traub & Ownbey, **comb. nov.** Syn.—**Allium reticulatum** var. **ecristatum** M. E. Jones, Contrib. West. Bot. 18: 21. 1935.

Allium canadense subsp. **fraseri** (Ownbey) Traub & Ownbey, **comb. nov.** Syn.—**Allium canadense** var. **fraseri** Ownbey, Res. Stud. State Coll. Wash. 18: 195. 1951.

Allium perdulce subsp. **sperryi** (Ownbey) Traub & Ownbey, **comb. nov.** Syn.—**Allium perdulce** var. **sperryi** Ownbey, Res. Stud. State Coll. Wash. 18: 202. 1951.

Allium geyeri subsp. **tenerum** (Jones) Traub & Ownbey, **comb. nov.** Syn.—**Allium geyeri** var. **tenerum** M. E. Jones, Contrib. West. Bot. 10: 28, fig. 55. 1902.

Allium persimile (Ownbey) Traub & Ownbey, **comb. nov.** Syn.—**Allium tolmiei** var. **persimile** Ownbey, Res. Stud. State Coll. Wash. 18: 29—32. 1951.

Allium cernuum subsp. **obtusum** (Ckll.) Traub & Ownbey, **comb. nov.** Syn.—**Allium cernuum** f. **obtusum** Ckll., in Torr. Bot. Club Bull. 18: 173. 1891.

Allium cernuum subsp. **neomexicanum** (Rydb.) Traub & Ownbey, **comb. nov.** Syn.—**Allium neomexicanum** Rybd., in Torr. Bot. Club Bull. 26: 541. 1899.

Allium nevadense subsp. **cristatum** (S. Wats.) Traub & Ownbey, **comb. nov.** Syn.—**Allium cristatum** S. Wats., in Am. Acad. Arts & Sci. Proc. 14: 232. 1879.

Allium fimbriatum subsp. **purdyi** (Eastw.) Traub & Ownbey, **comb. nov.** Syn.—**Allium purdyi** Eastw. Leaflets West. Bot. 2: 110. 1938.

Allium fimbriatum subsp. **parryi** (S. Wats.) Traub & Ownbey, **comb. nov.** Syn.—**Allium parryi** S. Wats., Proc. Am. Acad. 14: 231. 1879.

Allium fimbriatum subsp. **mohavense** (Tidestr.) Traub & Ownbey, **comb. nov.** Syn.—**Allium mohavense** Tidestr. Proc. Biol. Soc. Wash. 48: 39. 1935.

Allium monticola subsp. **keckii** (Munz) Traub & Ownbey, **comb. nov.** Syn.—**Allium parishii** var. **keckii** Munz, Man. So. Calif. Bot. 87, 597. 1935.

TRAUB—SUBSCETION **MEXICANAE**, continued from page 95.

SECTION **RHOPHETOPRASON**, GENUS **ALLIUM** L.:— Vegetative reproduction in **Allium glandulosum** and **A. kunthii (longifolium)** is so distinct from that of the other Alliums of Subsection **Mexicanae**, Section **Amerallium**, genus **Allium**, L., that it is necessary to group these under the new Section **Rhophetoprason**, in which the current season's bulbs, after flowering (seed setting), produce thick, smooth rhizomes; and the food in the bulbs and rhizomes is **reabsorbed** (leaving vestiges only) and is translocated to form **new** flowering-sized terminal bulbs.—**Hamilton P. Traub**

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

NEW AMARYLLIS SPECIES INTRODUCED

CLAUDE W. DAVIS

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Several new species of Amaryllis have been introduced in the winter of 1965-66 and commercially distributed to interested persons through the cooperation of Dr. Martin Cardenas, Professor and Head of the Department of Botany, Universidad Mayor de San Simon, Cochabamba, Bolivia. These include the following:

A. yungacensis Cardenas and Nelson, which was discovered by the co-authors in the Province of Sud Yungas, Bolivia in 1958. To quote the late Prof. Nelson, "This is a spectacular species. Its flowers are as large as ordinary American hybrid garden sorts and its colors and color pattern are bold. There is strong contrast between the large, yellow-green throat and the deep red of the outer one-third of the floral segments. The near white margins of the segments give it striking contrast with its surroundings. The coloration on both sides of the floral parts is very similar. The bold stripe along the mid-rib is present only on the inner surface of the segments.

"*Amaryllis yungacensis* appears to be easy to handle in cultivation and should be a fine addition to our pot and garden flowers. Its value as breeding stock is yet unknown, but it has several desirable characteristics."

In the experience of the writer this species is fertile and it produces viable seed quite readily when the flowers are pollinated with pollen from another clone.

Amaryllis starkii Nelson and Traub, was discovered in 1958 in a location about two miles from Santiago, Bolivia in the foothills of the Serrania de Santiago range of mountains. The bulbs were growing in an area of exposed rock which contained scattered pockets of sand and organic matter. The striking feature of this small flowered species is that the blooms are held upright on the scape. There are from one to three blooms per scape, depending on the age and size of the bulb. The flowers are a "tomato colored" pink with white throats. This species crosses readily with *A. belladonna*, *A. evansiae* and with numerous hybrids. It should be potted in a very porous soil mixture and watered very sparingly while in the dormant state.

Amaryllis umabisana Cardenas, comes from the Province Bilboa in Bolivia. It belongs to the Macropodastrum or Elegans Group, with white, trumpet-shaped flowers about 17 cm long. The bulbs obtained during the winter produced foliage which lasted for several months and then went dormant. Because it is native at a high altitude (2,000 m.)

where the air is cool and dry, it probably will not be well adapted to the low altitude and warm, moist atmosphere of the Gulf Coast Region.

Amaryllis mollevillquensis Cardenas. This species has never flowered in the region surrounding Baton Rouge, Louisiana, but it comes from a high altitude and arid climate from Province Bilboa, near Mollevillque, Bolivia. Each umbel bears 2 to 6 small flowers which are orange-red with a greenish base and a white stripe in the center inside.

Amaryllis forgetii Worsley. This is not a new species as it was originally described in 1912, but thus far it has not become widely distributed in the United States. The flowers present a striking contrast in color, being a chrysanthemum crimson, keeled in the lower half with green. The umbel is 2-flowered. This species is self-sterile, but it has been crossed with *A. yungacensis* and the hybrid seedlings are making a very vigorous growth. Apparently this is a species of easy culture which is well suited to either the greenhouse or to an outdoor planting in regions where the winters are mild.

FORCING AMARYLLIS IN WATER

Prof. Agr. Pier Luigi Arduino, Giornalista Agricola, Scrittore, Candia Lomellina, Via Borgoretto 3, Italy, writes under date of January 8, 1966, about forcing *Amaryllis* bulbs in water culture. Those interested should write directly to Prof. Arduino.

EXPERIENCES WITH AMARYLLIS 'SENORITA'

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Many growers shy away from *Amaryllis* species and simple species hybrids because they feel that such are likely to be difficult to grow and relatively unrewarding in bloom. However, 'Senorita', a hybrid of *A. evansiae* x *A. striata*, for me is very easy to grow and has striking flowers. The florets are borne two per scape and in shape very much resemble the photograph of *A. striata* published on page 128 of the 1965 *Yearbook*. What really makes them remarkable is the color. Prof. Davis, the originator, describes the coloration as "pink changing to soft pink as the flower ages, with a chartreuse star in the throat." To me, this description does not do them justice; my clone is a very wonderful blend of light cream yellow and pastel pink, the cream yellow becoming greenish in the throat. I know of no way to adequately describe it. A person must actually see the flower in order to have a good notion of what it really looks like.

My clone blooms freely from small bulbs. Large numbers of off-sets are produced, and often grow to blooming size within two years. The plants seem to prosper both indoors in a sunny window and in outdoor culture in large containers. Presently I am an apartment dweller with only a limited amount of indoor space and a small patio, but I am looking

forward to the day when I can have a whole bed devoted to 'Senorita' and other similar *Amaryllis*.

There is only one thing about 'Senorita' that is really disappointing—I have not been able to set seed using it either as a seed or pollen parent. However, I will keep trying until either I am successful or I become convinced that the clone is hopelessly sterile. In the meantime, I have ordered seed of other *A. striata* hybrids. I am grateful to 'Senorita' for introducing me to species hybrids; I recommend it to you.

ACCELERATING BLOOMING FROM SEEDS IN AMARYLLIS WITH BOTTOM HEAT

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About two years ago I received some *Amaryllis* seed which I believed was quite interesting and worthy of special effort. Upon making inquiry about methods for accelerating growth and obtaining bloom sooner, I was told that heat would help, but nothing would make them flower in a year. However, I decided to try. A box was made about twelve inches wide, 33-½ inches long by eight inches deep. A one-quarter inch diameter stainless steel tube was placed about one and a half inches above the bottom and three inches in from the side and running the long way of the box. The tube ran through the box at each end, thus supporting itself. A 25-watt heating element was put in each tube, controlled by a thermostat, which was put in the middle of the forward wall of the box. Three sixteenths diameter by 9-inch aluminum rods were placed across the stainless steel tubes one inch apart to distribute the heat evenly. The box was filled with fine sand. Twenty-one three month old seedlings were planted three and a half inches apart in the box. The thermostat was set to hold ninety degrees one-inch above the rods. The box was watered when needed until bulbs recovered from transplanting shock, then watered twice a week with a solution of one hundred p.p.m. each of N, P_2O_5, and K_2O. These elements were supplied from ammonium nitrate, di-hydrogen ammonium phosphate, and potassium sulphate. A year from the time the seed was planted, the bulbs touched each other. The *first bloom* appeared *fourteen months* from time of seed planting. One bulb had four scapes with a total of seventeen large flowers in twenty months. About one half of the bulbs flowered in two years. All had large off-sets. The box was maintained in a greenhouse that was heated to maintain a night temperature of sixty degrees and went as high as a hundred on summer days.

I believe that if the seeds had been planted directly in the box with bottom heat, the objective to obtain flowering size of all of the seedlings within a year and a half and at most two years, might have been achieved. This will be checked in a later experiment. On the whole the experiment was very much worth while, and it is hoped that others will report on similar experiments.

Fig. 43. **Crinum luteolum** Traub & Hannibal as grown in Mrs. Morris Clint's garden, Brownsville, Texas, June 1965. Photo by Mrs. Morris Clint.

CRINUM LUTEOLUM IN SOUTH TEXAS

Mrs. Morris Clint, *Texas*

About August 20, 1961 Mr. William Morris of Australia sent us a small bulb of the rare, yellow-flowered *Crinum* native to the area near Port Augusta, South Australia, which was later to be named *Crinum luteolum* (see Plant Life 22: 46. 1966). It was planted in a tall juice can and placed on one of the benches in our semi-shaded patio, where it grew very nicely. The severe freeze of January 9-12, 1962 came in sooner and much colder than predicted and the bulb went through at least 8 hours of sub-freezing temperature. It looked a little wilted, but fortunately soon recovered in the warmth of the greenhouse. The winter of 1962-63 was another cold one, so it was not planted in the ground until late in the spring of 1963. Bill Morris had written that the general habitat of this *Crinum* was semi-desert with an annual rainfall of less than 10″, so it was planted on a slope in a well-drained bed of sandy loam soil where it received full morning sun, very light afternoon shade and less than average watering. The bulb grew very slowly but seemed happy enough, so we stopped worrying about it and prepared to wait quite a while for it to bloom.

Needless to say, we were surprised and pleased to discover a scape early in June of 1965. We were even more pleased when the first lovely yellow flower opened on June 9th. The remaining 10 buds opened in pairs on successive days and, since each flower remained fresh well into the third day, there was soon quite a bouquet. A second scape carried 9 blossoms and started flowering about 2½ weeks later. Although we carefully hand-pollinated every flower, only a single seed was obtained. During the entire blooming period the weather was hot, dry and very windy, with abnormally low humidity but the flowers remained fresh and the scape upright. This is most unusual in our climate, for here very few Crinums last a full day and many open so late in the evening and droop so early in the morning that we never get to see them fully open at all. In addition, most of the scapes must be heavily staked to keep them from falling to the ground.

The winter of 1965-66 was fairly mild with fall, winter and spring moisture well over normal and the bulb remained evergreen all winter. So far this year (July 3), the bulb has produced 3 scapes. The first one, which started blooming on June 4th, had 17 flowers; the second one, with 16 blooms, opened its first flowers on June 18th; the third, with 14, a few days later. Although we were not able to pollinate but a few flowers, seed production looks more promising. The plant is well foliaged, but still rather small—so small that one wonders how the bulb can support 3 such large, robust scapes (about 20-22″ tall) with so many flowers.

Blooming conditions this year were radically different from those of 1965. Except for the first 10 days, when it was hot, still and sultry, it has been cool and humid, with almost no wind. It showered lightly

on June 7th, rained heavily on the 13th and 14th and continued daily showers for over two weeks gave us almost 6″ for the period.

We would place this species close to the top of the *Crinum* list for our area. It seems to thrive under almost any weather conditions and requires little or no care; the blooms are large, gracefully beautiful and very long lasting. The color here is Dresden Yellow 602/2 on opening (which is usually before 4 P.M.), fading to 602/1 the next day. The flower is about 4-5″ in diameter at natural expansion, heavy and waxy in texture, with segments from 1 to 1⅛″ broad, and 2½″ or more in length.

Fig. 44. Unidentified **Amaryllis** as grown by Burr Clouette, Columbia, South Carolina, 1966. See text for further details.

NOTES ON AMARYLLID CULTURE

Burr Clouette, *South Carolina*

AMARYLLIS

In 1962, I ordered some *Amaryllis* bulbs from Mrs. Barry of Pairieville, Louisiana. As one of the extras she sent a small bulb labeled *Amaryllis divifrancisci* Cardenas. She indicated that it was difficult. Her instructions were that it be potted in a very porous, gritty mixture; water was to be sparingly applied, and that it be allowed to go dormant if growth declined. However, as shown in Fig. 44, this is not the typical *A. divifrancisci* as figured in Fig. 11, page 34 of the 1960 Amaryllis Year Book.

I potted it in a mixture of half "Black Magic" and half coarse decomposed granite. It started to grow, and it was regularly but

cautiously watered, and fertilized with fish emulsion at regular intervals. It grew until early winter when it became dormant, and remained so for five months. When growth resumed, it increased slowly in size, and made a few offsets. During the winter of 1963-64 it had another long dormancy similar to the one of the previous season. The same regular watering fertilizing was followed during each growing season. As it

Fig. 45. Three **Amaryllis**: from left to right, the clone 'Cuenca', **Amaryllis belladonna (equestre) x A. evansiae**, and **A. evansiae**, 1966.

increased in size it formed more offsets, and all were moved to larger pots as necessary. When it went dormant in 1965, I removed the remaining offsets (three in number), and potted the parent bulb in a five-inch azalea pot.

Just after the turn of the New Year, a bud started to emerge from the dormant bulb. The first week in February, the scape was 14 inches tall, and the first of the four buds opened. The buds were in two sets.

Two opening a few days apart, and the other two did not open until nearly two weeks later. The flowers were good keepers, lasting over a week in the house under fluorescent lights. As they bloomed under such lights in the house, my description of the color may not agree with that of blooms produced outdoors.

The buds were greenish, becoming yellowish-greenish as they matured. The open flower was quite yellow (Nickerson color fan, 7.5Y 9/8), faintly brushed purplish-red; throat green; style and filaments green below, whitish above; pollen yellow; stigma only slightly trifid. The stigma and anthers were exserted beyond the face of the

Fig. 46. **Worsleya rayneri** seedlings as grown by Mr. Burr Clouette, Columbia, South Carolina, 1966. Two year old seedlings, the small one in front is of same age as two larger ones in rear; the one in plastic pot, two years old, is from Hummels.

open flower. The flowers were approx. 3 inches in diameter and 2 inches deep, round, flat-faced at maturity, although they were quite conical at first. The 3 widest tepalsegs were over an inch wide; two were less than, and the bottom one only half an inch wide.

I have selfed the unidentified *Amaryllis,* and have used pollen of the yellow Davis hybrid on it, but do not know as yet if seed is forming. I am also using its pollen on most of my other *Amaryllis* as they bloom hoping for something interesting in the hybrids.

A bulb of Goedert's SA 62-4 bloomed in January-February, 1966. It is apparently a form of *Amaryllis belladonna L.* The flowers were a clear tomato red with greenish-yellowish throat.

Among the other *Amaryllis* that bloomed in 1966, the clone 'Cuenca', an *A. belladonna* x *A. evansiae* cross, and *A. evansiae* were notable. These are shown in Fig. 45.

WORSLEYA RAYNERI

Some progress can be reported with the growing of *Worsleya rayneri* from seeds. As shown in Fig. 46. The seedlings have now reached the age of two years, and are assuming their characteristic form.

AMARYLLID NOTES FROM FLORIDA, SEASON 1965-66

Mrs. Fred Tebben,
Box 12, Lake Hamilton, Florida, 33851

Here in Florida the blooming season for *Amaryllis* and other members of that family is a long one. Buds began appearing in late February and the first outdoor bloom opened on March 11th, and continued for two months, on up till about May 10th. Before the amaryllis were done with their lovely bloom, the daylilies started, and now the crinums are lovely and the early blooming daylilies are starting in to give their second display of flowers.

In late January we had a very severe cold spell, with the temperature going way down in the low twenties, but it lasted only one night and while much damage was done to tender tropicals, no harm came to the citrus groves as in 1962. *Crinum* foliage was frozen down, and a few red spots appeared on amaryllis leaves, but no permanent injury to anything.

For the first time since moving to Florida my seedling bed of amaryllis bulbs put up a wonderful show for me. Some of these seedling bulbs are very old for I have babied them along for many years, growing them in beds up in Illinois for the very short growing season there and resting them bare-rooted over winter. They have been in the soil here since November, 1961, and this is their first season of bloom. Many were very lovely and just as good in every way as the so called Dutch clones. All my markers have disappeared in that time and it is rather frustrating not to know just who made these crosses and what their parent bulbs were. A few proved not to be very good but all my neighbors wanted them so I gave away many of the reds that I felt were not worth keeping or were duplicates, and that made room for more of the better ones. There was one just like "Silver Lining", a pure lovely rose pink, a number of really good salmon pinks, some with white center that were especially pleasing, some whites with stripings of red and some with red dots sprinkled over the white, but all very pleasing to me after waiting so long for their bloom.

Among my Dutch bulbs some have disappeared from that bed and I can only conclude that I have lost them, so will stick to the ones that seem to do so well in the borders here. 'Apple Blossom' is outstanding, as are most of the whites. 'Beacon' bloomed nicely, and 'Pink Favorite' was lovely, 'House of Orange' gave a fine display for it had twelve

blooms all open at once, a real bouquet in itself. 'Royal Dutch' was nice and so was 'Rose Queen'. I was given four nice new pinks and they are indeed fine ones. 'Queen of the Pinks' was a nice deep rose with darker center, 'Flora Queen' was a much lighter pink, in fact the lightest of the pinks I have, 'Sight Show' a nice rose pink, but 'Dutch Belle' failed to send up a bud stalk this year. Among those I seem to have lost are 'Delilah', 'Fantasy', 'Purple Queen', 'Pinkster Flower' and 'Bouquet'.

Among the crinums blooming are 'Ellen Bosanquet', one of my favorites, the Christopher Lily (*Crinum giganteum* hybrid), which is so fragrant and like a cluster of white tulips in bloom, and Crinodonna 'Fred Howard'. All these are very nice. I like 'Louis Bosanquet' also but it offsets so rapidly it is hard to control. *Crinum scabrum* and several other "Milk and Wine" varieties are also in bloom. *Zephyranthes seem* to disappear from the garden but the two *Habranthus* species *robustus* and *brachyandrus*, seem to do well and multiply rapidly.

Daylilies are gaining very rapidly in popularity in Florida, and the evergreen varieties make nice landscape subjects, though the deciduous ones do well here too, since we seem to have enough cold weather to make them go dormant. There is a daylily grower near here who specializes in the Wheeler hybrids and I visited his garden one Sunday when many lovely ones were in bloom, but no one was there to sell them that day so I will go again.

My husband passed away quite suddenly on April 14, 1965. It has, of course, been a very great blow to me since he had such a short time to enjoy his retirement, and I was at a loss to know just what I should do alone in Florida. But I have fine neighbors and friends, and with my garden to care for, and a few other hobbies such as reading and knitting, I manage to make a life for myself, even though I am very lonely without him.

CRINUM CULTURE IN MARYLAND—FURTHER NOTES

William W. Zorbach

Success in the wintering over of hardy crinums in this area has been maintained now for seven years; previous reports have been given in Plant Life, *19*, 101 (1963) and *21*, 145-148 (1965).

The large clumps produced by *C.* 'Cecil Houdyshel' and *C.* 'Ellen Bosanquet' were dug and separated in the spring of 1965. The bulbs of the latter were planted individually in the raised bed along the east wall of the house, whereas those of *C.* 'Cecil Houdyshel' were planted in clump fashion in a newly prepared, small bed containing sandy soil some eight feet away from the southeast corner of the house. In this relatively unprotected location, the latter bulbs easily survived the winter, despite a blizzard in late January of 1966, which dumped nearly 30 inches of snow in the writer's back yard. Accompanying the snowfall was a severe cold spell which persisted for many days.

The spring which followed was very late; nevertheless, during the first warming, the three subject crinums pushed up readily. Before

growth had advanced, the individual bulbs were fed in a manner similar to that for trees. Around each, several holes were poked into the soil to a depth of 12 inches, and were packed with Bovung. This treatment proved to be most salutory, for the performance of the crinums this year was the best to date. Not only was leaf growth more luxuriant, but there was an increase in the number of scapes, some appearing even from relatively small offsets.

C. scabrum is definitely unsuitable as a hardy plant in this area. A single, blooming-size bulb was secured early in the summer of 1964, and was planted 6 inches deep along the (warm) east wall of the house. Shortly thereafter, it bloomed weakly, but took most of the summer to establish itself. When the frosts arrived, it was covered, but during the following spring its leaf stalk emerged long after those of the other hardy crinums. Nevertheless, it made excellent leaf growth during the summer without blooming. It was also noted that, in sharp contrast to *C. powellii album*, 'Cecil Houdyshel', and 'Ellen Bosanquet', the leaf stalk of *C. scabrum* "kills back" to a greater depth during the winter months. In fact, it is this circumstance and not the hardiness of the bulb *per se* which militates against the wintering over of this species. Because of the very long delay this year (1966) in the arrival of warm weather, rotting had continued downward, destroying the inside of the bulb. At the same time, the exterior segments of the bulb were intact.

It was reported previously that, with proper protection, *C. asiaticum* would withstand Washington winters. For such treatment, the winters should be mild and, more important, the advent of warm weather should be early to late March, for example. But during the past few years, these conditions have not, alas, been observed. During late March and much of April, there has been an alternation of warming and freezing periods, which has proved to be a hardship even for the hardy crinums grown here.

Thus, the long delays in the arrival of permanently warm weather make it difficult for *C. asiaticum* to regain its strength each year and, because growth is so slow in this species, recovery is not adequate for the production of blooms before the frosts occur in the fall. Accordingly, the small specimen planted permanently outdoors in 1962 was dug, and is now handled as a tender bulb.

In June of 1964, two magnificent specimens of *C. asiaticum* were secured from Wyndham Hayward, each measuring nearly 4 inches in diameter. These were planted immediately in a small bed of sandy soil. Each bloomed shortly thereafter; however, the blooms were somewhat weak due to lack of establishment. This species sets seeds extremely readily, and seven of the ones produced by the new bulbs were allowed to ripen. All seven germinated in a small pot containing sand and vermiculite, although the gestation period was, on the average, five months. The seedlings were planted together in a large pot and were carried over this way in a newly constructed conservatory (electrically

heated) abutting the south side of the writer's home. They were planted out in the open soil this summer (1966) and will be treated as tender bulbs.

With the knowledge that *C. asiaticum* does not winter over satisfactorily, the two new specimens were dug prior to the first killing frost in the fall of 1964 and, after trimming, were laid aside until December. They were then planted about 3 inches deep in 16-inch redwood tubs containing very sandy soil, with much bonemeal added, and brought into the conservatory to afford maximum light. Growth was slow, but steady, and in early May the tubs were brought outside in full sun. The two crinums were well watered and fed periodically with Ra-pid-gro. Growth was excellent, and by September 1, each had produced one scape. They were returned to the conservatory in late October, and from that date until May of this year (1966), when they were brought outdoors again, each produced four scapes, providing almost a continuous bloom during the winter months. This summer, growth has been excellent, and the bulbs are now five inches in diameter. In fact, the root systems have proliferated so much that the soil level in each tub has been elevated one inch. At this writing (Sept. 1966), the second ones are about ready to bloom.

Crinum bulbispermum has wintered over with ease, and this summer, one of the two specimens bloomed, albeit weakly. Although perfectly hardy, its performance does not match that of the other hardy species grown here. It appears that its growing conditions are quite different, and, whether this be a function of the soil, amount of water, or sunlight, or a combination of all three has not been determined. Additional experimentation with this species is envisaged.

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UNGERNIA CULTIVATED IN THE UNITED STATES

BURR CLOUETTE, *5225 Spalding, Columbia, South Carolina 29203*

Recently my good friend, Prof. A. A. Samuelson of Richard, Washington, a *Delphinium* and *Amaryllis* enthusiast, sent me a bulb of *Ungernia*, species of which have probably not been cultivated previously in the United States. He had received several bulbs from a friend in Albuquerque, New Mexico, who is collecting, importing and growing plants from the U. S. S. R. The *Ungernia* species came from the Steppes of Kirghis. He also sent an illustration (Fig. 47) and a description in Russian. Mr. Aleck Korsakoff kindly translated these descriptive notes by N. Sikura as follows:

Ungernia (probably *U. ferganica* Vvedensky, 1935) has been grown in the Central Republic's Botanical Garden for the past three years. The attractive oppositely arranged leaves appear in early April, but by mid-June they dry up, and about a month later, the leafless plant produces a compressed scape with a one-sided umbel of rosy flowers,

resembling some other amaryllids. Flowers continue to open for about three weeks and single flowers last from 8 to 10 days. In culture the height of the plant and size of the flowers increase about three times; the height of the scape reaching 55 cm.

Fig. 47. **Ungernia** sp. (probably **U. ferganica** Vvedensky, 1935). Drawing by A. Pirozhenko.

Ungernia increases easily by splitting of the bulbs, which are cut into four parts. In about a month bulblets form on the cut parts which gradually grow into mature plants.

Bulbs are best planted in the fall. If planted in the spring, blooms will be delayed for one year.

Ungernia is a plant with few requirements; when growing on the Steppes, they do not require watering, and get along with the natural rainfall. In the Botanical Garden we multiply the plants and when large enough, they are passed on to the nurseryman.—N. Sikura (translated by Aleek Korsakoff)

Traub & Moldenke, in "Amaryllidaceae: Tribe Amarylleae" (1949) reviewed the genus *Ungernia* Bunge. The reader should refer to this review for further information.

DAYLILY REPORT 1966

W. Quinn Buck, *Chairman, Daylily Committee, American Plant Life Society*

The 1966 season was marked by the blooming in our garden of some fine new daylilies, both tetraploid and diploid. Perhaps the most exciting new diploids should include 'Jewel Case' (Lester), 'Porcelain Doll' (Lester), 'Beauty Pageant' (Fay), 'Prairie Thistle' (Marsh), and 'Prairie Chief' (Marsh).

Mrs. Hugh Lester's 'Jewel Case' proved to be an amazingly beautiful combination of a bright green throat blending into a mixture of cream and clear pink for petal and sepal color, set off by a lavender midrib: it seems a sort of pinnacle for this type of flower, of which there have been some very fine ones in recent years. Its wonderful shape, substance, and finish were enhanced by vigorous growth and excellent reblooming characteristics.

'Porcelain Doll' was an equally delightful small pink-and-salmon cream bicolor, round, flat, and of wonderful finish and substance. 'Carita' (Lester) did not appear happy in California this year, although it was reported as being extremely good on the East Coast.

Orville W. Fay's 'Beauty Pageant' was a most outstanding new large pink flowered daylily this year; it is wonderfully clean and bright in its color, which contains no salmon and is quite different from Mr. Fay's other pinks. Incredible branching and the size of the flowers made the slender spikes bend a little too much, although this may have been aggravated by the amount of shade from the nearby walnut tree. 'Grace Lenington' (Lenington) as a second-year plant had improved amazingly, being a huge lavender-pink of spectacular quality. Miss Spalding's 'Pink Fluff', 'Zadol,' and 'Lissy' again were among the most pleasant of the clear, bright pinks; 'Pink Fluff' was an especially fine performer, with rounded, nicely shaped flowers.

'Prairie Thistle' (Marsh) was an agreeable addition to the clear lavenders, having no hint of muddiness and being unaffected by our difficult climate; its flat shape had a bit of perkiness because of the spacing of segments. 'Lavender Flight' (Spalding) remained the finest of the lavenders, for clear color, good shape, and smooth finish; its spikes did try to grow too tall this year.

'Prairie Chief' (Marsh) was a remarkably clear dark red that makes one wish to see it again and again in order to find out if it can remain so good in this climate. It had much of the quality of the Claar reds as grown in the East, none of the latest of which have been tried here yet.

Among the tetraploids 'Dazzler Gold' (Childs) did not show as much of its 'Cartwheels' parent as one would have liked. Neither 'Cathedral Bells' (Childs) nor 'Tetra Edna Spalding' had very good color this year, our climate having given them a heavy infusion of muddy salmon to mar the pink. Undoubtedly all three of these clones should improve as the plants get stronger.

Mr. Fay added two more fine tetraploids to his releases in 1966: 'Lady Cynthia' (Fay T63-24, illustrated in Fig. 30 on page 115 of the 1965 *Plant Life*), a pale melon sister of the cream 'Kathleen Elsie Randall' released in 1965, and 'Gertrude Smith', which made such a sensation when it first opened its huge "pongee pink" blooms in Mr. Fay's field, and which he still considers the finest of his cross of 'Crestwood Luey' X 'Crestwood Ann'. These Fay tetraploids undoubtedly will prove to be wonderful breeding material.

A visit to Dr. Hamilton P. Traub's garden in La Jolla, California, made it possible to see just a few of his newest seedlings. 'Red Butterfly' was a huge flower of very pleasant rose and red tones and of very good shape and finish; the spike was a reasonably good height and in scale. Some of the yellow and gold butterfly-type seedlings tended to be too tall still, as did the lavender and purple seedlings; however, a good percentage are the desired medium height. One of the most outstanding breaks in the Traub garden was a truly everblooming seedling yellow which should be invaluable in giving many everblooming seedlings in this strain.

In the Buck garden the most interesting new tetraploid seedlings as a group were the offspring of 'Tetra Marsha, Russell' some being very fine round flowers. The beautiful 'Tetra George Cunningham' produced a good seed crop in combinations with other fine varieties, and 'Tetra Quincy' also gave more viable seed. Among treated plants that bloomed for the first time this year were 'Frances Fay,' 'Hilarity,' and the important and beautiful 'Blue Jay,' which should give many interesting crosses from the late fall blooming.

THE MILK AND WINE LILY CONFUSION

L. S. Hannibal, *Fair Oaks, Calif. 95628*

For some years the writer has been trying to unsnarl the overlapping nomenclature of the hardier Florida Crinum types which are commonly rated as the "Milk and Wine Lilies." The first suspicion that some of the presumably valid species were actually hybrids came when several clones were found to be pollen sterile. Then with the importation of true species numerous irregularities became apparent. The final confirmation came when the writer examined a number of old garden catalogues dating from 1885 to 1910. Evidence of hybrid introductions, misnaming, and early confusion became apparent from the start.

In short all of the central African species cross readily with *Crinum bulbispermum album*, which includes *C. kirkii*, *distichum*, *yuccaeflorum*, *sanderianum*, *scabrum*, *fimbriatulum*, *giganteum* (*Jagus* Thompson; recognized name in Hortus III) and others. These tropicals when hybridized with *bulbispermum album* tend to blend their characteristics by yielding foliage something like *C.* x *powelli album*, trumpet flowers with a light red or pink keeling to the tepals, deep growing bulbs and a

fair resistance to wet or cold winters. Some hybrids are fertile to the extent that they produce viable pollen, others are pollen sterile. Sometimes sufficient features show up to make it possible to identify the missing parent. In several instances the crosses have been repeated in sufficient quantity to be fairly certain of the parentages involved. In other cases we are left wondering if *scabrum* x *zeylanicum* or other such hybrid combinations were involved, but the major difficulty is that few of these hybrids bear hybrid names. Practically all have replaced the tropical parents because the latter are not cold hardy.

The first hybrid to be introduced as a species was the *C. fimbriatulum Hort* as the "Milk and Wine Lily" from Nassau in 1887 by P. F. Reasoner of the Royal Palms Nursery. The blossoms are described as three to four inches in diameter, striped white with carmine. It does not appear to be the plant that Henry Nehrling described 25 years later; as Nehrling reports the species is difficult to grow. The fact that it does not give seed suggests a hybrid. However, the plant is significant as it was the original "Milk and Wine Lily."

Reasoner seemingly crossed a number of *Crinum* species as he offered a *C. kirkii* x *bulbispermum album* in 1895 which he reported as similar to *kirkii*, but hardier and of lighter color. The bulbs vigor and greater resistance to frost soon displaced the surface growing, winter tender *C. kirkii*. It is now the sterile "*C. kirkii Hort.*" of our gardens. Since the plant was never named we suggest 'P. F. Reasoner' for the clone.

Crinum scabrum crosses very freely with *C. bulbispermum*. The original hybrid is Dean Wm. Herbert's *C.* x *herbertii*. The first commercial clone was introduced by van Tubergen about 1890 and many sibling crosses have appeared since. Even the writer has tried his hand with this one. The form with the prominent red stripe so commonly encountered in the Gulf area has been recommended for the clonal name 'Gulf Pride'.

The cross of *scabrum* or the other "*Milk and Wine*" on *C. bulbispermum roseum* yields solid colored pink to red flowered hybrids in lieu of the red keeled "Milk and Wine." One of the better of these *C.* x *herbertii* crosses is the attractive 'Thaddeus Howard'. It is a robust plant with foliage larger than *C.* 'Cecil Houdyshel' and open, soft red blossoms. Practically all *herbertii* have viable pollen but will only strike on the parental forms or related *scabrum* types such as *C.* 'Cecil Houdyshel', 'George Harwood' or 'Ellen Bosanquet'. Where two red color genes can be brought together as in Mrs. Grace Hinshaw's 'Summer Glow' the solid red trumpet is exceptionally vivid.

Crinum zeylanicum appears to be quite common in Florida and like *scabrum* it is a good breeder. It is often called *C. ornatum* since it is that plant which was featured under the name *ornatum* in the Botanical Magazine at 1171, only to be lumped with *C. zeylanicum* of Burma due to close similarities. In fact if we follow the classification of L. Heritier, *C. zeylanicum* is considered to be a subspecies of *C. latifolium*. With our present day knowledge of plant migration, most of which occurred

in past pluvial periods, the probability of a west African species being closely related to a Burmese species appears rather remote. Unfortunately Dr. Carey's critical analysis of *C. latifolium* and *C. zeylanicum* has been completely ignored, otherwise it would be realized that the Asian form of *zeylanicum* and *latifolium* are rather remotely related. His description in "Flora Indica" also brings out the fact that *zeylanicum* in Asia has little in common with the west tropical African *ornatum*. The former has a narrow deeply channeled leaf with entire margins whereas *ornatum* has semi erect slightly glaucous foliage some 2 inches broad with scaberous edges. Both Wyndham Hayward and the writer are in full accord that the west African form is definitely entitled to its original status. This becomes particularly evident when the *ornatum* x *bulbispermum* hybrid is compared to the Asian and African *zeylanicums*. The hybrid is more representative of the Asian form. The blossoms on the hybrid are borne on a 14-inch scape and in lieu of being compact radiate out like spokes on a wheel. They are striped like the typical "Milk and Wine", but are not so conspicuously flared as *kirkii* or *scabrum* crosses. The pollen is quite sterile.

The small hybrid known as *C. sanderianum Hort.*, is also sterile. From its habits and features it could readily be a sibling of Reasoner's "*C. kirkii* hybridum." The only significant differences are in the sizes of the blossoms. The latter is half the size of the "*kirkii* hybrid."

Before closing we should certainly mention something about *C. amabile*, *C. augustum*, *C. erubescens* and *C. kunthianum*. All have narrow tepals which are highly colored. On numerous occasions the writer has heard them referred to as "Milk and Wine", but they do not have the trumpet-shaped blossoms of the latter, or the tapering sharply pointed leaves. *C. amabile* belongs to the Stenasters and all the others to platyasters which means the latter have blossoms shaped like *C. americanum*, although they are colored.

Even though these plants and *C. americanum* belong to different subgeneras they will cross with *C. bulbispermum* and *macowanii* as well as with hybrids like *C. 'Cecil Houdyshel'* or *Powelli album* (taking the pollen of the latter only). In a half dozen instances second generation crosses have been obtained. As a consequence there are far more complex hybrids scattered about than is realized and the identity of some can be quite perplexing. However, Stenaster x Coconocrinum have slender, acutely pointed tepals and Playaster x Codonocrinum semi slender bluntly tipped petals. 'Peach Blow' has long been considered a "Milk and Wine" type but its petal shape is definitely Platyaster x Codonocrinum. The bluntly tipped, strap like foliage rules out any parent with acutely tipped slender tapering leaves. From the dilute color only one parent was colored, the other was white. Unquestionably one was hardy, the other semi-tropical. Other parental factors are the spicy fragrance, the type of veining in the leaves and the finely toothed or scaberous leaf margins. Both *scabrum* and *ornatum* are eliminated as probable parents because the pointed foliage would be apparent in the F-1 hybrid. To meet the majority of conditions our most probable

selection is *C. yemense* x *augustum*, but we must also consider the true *erubescens* and *kunthianum*, and less likely 'J. C. Harvey' x *americanum*. The fact that 'Peach Blow' has viable pollen and will cross with *bulbispermum* may give a clue concerning the parentage.

One may wonder why the interest in tracing parentages. Thus far the writer has checked out some forty hybrid Crinums and we know the breeding capabilities as well as those combinations which give vigor, good form and color, or resistance to cold or summer heat. Breeding progress is being made because we can avoid many sterile combinations and then eradicate poor siblings if the material is not up to expectations. Thus far the production of second generation material is just beginning but it promises to be interesting.

FREEDOM OF FLOWERING IN NERINE SARNIENSIS

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Although the beautiful *Nerine sarniensis* is native to the Cape Province it is not widely grown here in South Africa. The chief reason for this lack of honour in its own country is that this particular species has gained a not altogether undeserved reputation for being tricky. Often it appears to grow and increase well, but flowering is so erratic and tardy that after a few years many gardeners give it up in disgust and grow the not quite so beautiful but hardier and more free-flowering species such as *Nerines filifolia*, *humilis* or *bowdenii*. Nevertheless some gardeners regularly produce dazzling displays of these fascinating flowers with apparent ease. Their success may well be due to their thorough understanding of the cultural needs of the plant, but good fortune in obtaining a free-flowering strain of *sarniensis* must also have played a big part in their succes.

Some years ago I was on the look out for a free-flowering strain which would set seed freely. Accordingly I set up a small experiment to test the different available forms of this variable species. I ordered mature flowering-size bulbs from five different commercial sources (Lots A to E) and had three collections made from the wild (Lots F to H). For comparison purposes I used a very free-flowering form of *N. humilis* from Caledon (Lot I) and that well-known, reliable, hybrid nerine "Gaiety" which had been sent to me by Mr. Stanley Smee of Ipswich (Lot J).

Each of the first nine groups (A to I) consisted of 6 bulbs, but only 2 mature bulbs of "Gaiety" were available. I planted these groups in a well-drained, raised bed in the open. The soil was a rich, uniform mixture and I was careful to give all the bulbs similar treatment in the way of water, light, spacing and food. Spacing was four inches apart in rows ten inches apart. For four years I kept careful records of the number of followng stems produced by each group of bulbs. The results of this simple experiment are set out in the Table 1, below.

TABLE 1.

Lot	No. of bulbs.	No. of flowering stems each year. 1st	2nd	3rd	4th	Totals	REMARKS
A	6	2	3	4	3	12	Fair. Insect damage 4th year.
B	6	1	3	0	0	4	Very tardy. Prolific offset production.
C	6	5	2	5	2	14	Free-flowering in alternate years only.
D	6	0	0	1	0	1	Healthy but remarkably tardy.
E	6	4	4	5	6	19	Very free, few offsets.
F	6	1	4	5	7	17	Very free. Bulbs not plump on arrival.
G	6	1	3	2	2	8	Tardy, dwarf form. Many offsets.
H	6	2	3	4	5	14	Fair.
I	6	5	5	6	8	24	Very free-flowering. **N. humilis.**
J	3	2	3	3	5	13	Extremely free-flowering. Gaiety.
Totals	23		30	35	38	(126)	

COMMENTS: Different strains of *N. sarniensis* seem to vary enormously in their ability to produce flowering stems even under uniform conditions. Of the first eight groups only E and F were satisfactory while most of the others were mediocre or poor. Lots B and D were exceptionally poor. It would seem worthless for a gardener to persevere with an inherently poor strain. Good soil, ideal conditions and care will not make up for a built-in resistance to flowering.

It is these poor-flowering strains that have given the whole species its undeserved reputation for tardiness, and commercial growers who propagate and distribute inferior forms are doing their customers and the species a real dis-service. The trouble is that the distribution of poor forms is likely to continue or even to increase because two of the three worst flowerers are healthy growers and are most prolific in their offset production; whereas the excellent strain E produced only 3 smallish offsets from 6 mature bulbs in 4 years under good conditions—a hopeless proposition for the commercial grower.

Some strains (Lot C) appear to follow an inherent pattern of flowering every second year. The lean year follows a season of free flower production and prolific seed setting and is used to enable the bulb to build up its reserves for the following season. Presumably Lot C arrived after a year of rest or perhaps the flowers of the previous season had been cut early for marketing before they could set a crop of seed.

The oft-recorded statement that *Nerine sarniensis* resents disturbance and so will not flower the year it is moved does not seem to be generally true. Under the conditions of my experiment it can be seen that if bulbs of a good strain which have reached flowering size are planted in rich soil at the correct time and given proper care a surprising number will flower the first year, as in Lots C and E for example. The surprising lack of first year flowers in the excellent Strain F was caused by the shrivelled condition of the bulbs when received. When bulbs have been well-fed and acclimatised to their flowering site one would expect the numbers of flowers to increase each year. This is what took place, but there was something of a levelling out during the third and fourth years. Some mature bulbs from which flowers were expected

broke down to produce offsets instead, and by the fourth year the picture became complicated by the flowering of offsets, as for example in Lots I and J. These remarks refer to *Nerine sarniensis* only, for I have found quite a marked falling-off of flowering in the first year after transfer to fresh ground with such species as *N. bowdenii* and *N. flexuosa*.

One frequently reads that to flower freely nerines must become crowded and tightly root-bound. My experience under South African conditions conflicts with this dictum for I have found that my plants flower more freely in the open ground than they do in pots and they do not seem to resent being spaced 4 to 5 inches apart in rows 10 inches apart. On the contrary, they seem to enjoy it. Yet I must confess that I have lost several valuable pot-grown hybrids through over-potting, especially with small or not very vigorous varieties. Pot plants seem to require a great deal more watering than plants in open beds and this extra water soon turns the soil sour unless roots penetrate the potting-soil rapidly before sourness develops. It is a mistake to overcrowd pots so much that most of the bulbs remain in a half-starved state for years so that they seldom get the chance of forming the six leaves usually needed to ensure a flowering stem the following year. The ideal is to have a few bulbs in a smallish pot containing a fertile, freely-draining compost and to repot before overcrowding causes a falling off of flowers.

The experiment confirmed the free-flowering properties of the Caledon form of *N. humilis* which produced more flowers than the best strains of *sarniensis*. Even more spectacular was the performance of the old hybrid Nerine x "Gaiety" which can always be relied upon to produce masses of flowers year after year. In proportion to the number of its bulbs (3 only) it produced more flowers than any of the other varieties tested. In my experience many hybrid nerines are more free-flowering than their species-parents. Some owe this property to their undoubted hybrid vigour; others owe it to their complete or partial sterility which prevents the exhausting process of seed setting: but there are other seed-setting hybrids which are reliably floriferous, because they are the end-product of years of careful selection by breeders who were aiming to produce a beautiful and a free-flowering hybrid. As the good hybrids which contain this property (many beautiful varieties do not possess it, alas) become more widely distributed, I am sure this exquisite beauty will become increasingly popular in the greenhouses of cold countries and in the open garden in countries with warmer and sunnier climates.

LYCORIS IN LOWER GULF COAST REGION

Claude W. Davis, *Louisiana*

One of the most satisfactory bulbs for late summer flowering in the Lower Gulf Coast is *Lycoris radiata*. These spectacular, orange red flowers seem to bounce out of the bare ground in September after

rains in August and early September. Foliage growth follows flowering and remains green during the fall and winter, maturing and dying down in the spring.

Bulb division is rapid and within a brief period large clumps are formed. The plant naturalizes readily and will continue to grow and flower for years in the same bed without separating the clump. As a result they are comparatively inexpensive and are extensively used for yard decoration or as cut flowers. The foliage is not affected by the mild winters which generally prevail in the region, but a few years ago a severe spell of cold weather dropped the thermometer to 10 degrees F., the coldest in fifty years, and the foliage was killed. The bulbs were not hurt, but new growth was checked and the bloom crop was light the following season.

The Florida "Hurricane Lily" or *Lycoria aurea*, which is a yellow form, will grow and flower in protected locations, as the south side of a building, as far north as Baton Rouge, La. It is much more tender to cold than is *Lycoria radiata*, but is considered to be more desirable.

Several years ago bulbs labeled *Lycoris radiata alba* were obtained from a grower in Japan. These are not a pure white, but might be described as ivory white. This variety is not quite as hardy as the red form, but the bulbs have survived, increased and flowered for three years. A bed of these makes a very striking appearance, probably due to the great contrast with the more commonly grown red form.

SEED AND PLANT TRADE CATALOGS RECEIVED

APRIL, 1966, OFFERING OF SEEDS, LARGE- AND SMALL & FREE-FLOWERING HYBRID AMARYLLIS. Ludwig & Co., P. O. Box 18, Hillegom, Netherlands.

"LUDWIG AMARYLLIS" 16th EDITION, [1966-67] CATALOG. Ludwig & Co., P. O. Box 18, Hillegom, Holland. Profusely illustrated in color of named and registered Hybrid Amaryllis clones, *Sprekelia formosissima*, and *Cyrtanthus purpureus*. Thirty-two pages, and cover also in color. August, 1966.

UNIVERSITY HILLS NURSERY CATALOG, 1966-67. Claude W. Davis, Proprietor, 470 Delgado Drive, Baton Rouge, Louisiana, 70808, featuring Hybrid Amaryllis, Amaryllis species, Louisiana Iris and other *Iris; Hemerocallis*, Crinums, *Crinodonna*, Chalice Lilies (*Hymenocallis*, etc.), *Gloriosa*, Zephyrantheae, *Curcuma* and *Kniphofia*. 24 pages.

PRESEASON PRICE LIST, 1966-67. Nov. 1966. 7 pages. Robert D. Goedert, Amaryllis Dealer, Jacksonville, Fla. 32205. Hybrid Amaryllis clones, and seeds; *Amaryllis* species; *Lycoris; Eucharis; Haemanthus; Gloriosa*, and Gingers.

THE 1965-1966 AMARYLLIS SEASON

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This past flowering season was one of the best in several years. Particularly fine reports were received from Texas, Louisiana and other parts of the south. It appears that many beds of amaryllis in the south have recovered from damage received during past severe winters. The past growing season was good here and in Holland and other areas which accounts for many of the fine flowers. The bulbs received from Holland were especially good this past season and almost all flowered exceptionally well. At the present time it appears we will have another fine growing season in 1966 and next spring should be even better than that of this year. This should help to stimulate interest in this fine flower.

I received many fine reports from those who have been growing seedlings both in the border in the southland and in pots in the north. More people should try their hand with seed. It is fascinating and with the availability of good seed one can flower sorts not seen in the named varieties. With some understanding of requirements and a little special attention to details one can be successful in flowering seedlings in three years.

Due to many inquiries as to the care of amaryllis I would like to touch on this subject a little and possibly provide some information from my experience that might help those who have experienced diffieulty in growing these fine plants. Possibly I may be of help to a number of fanciers to again stir their interest to new heights and keep them from falling into the pit where most amaryllis fanciers find themselves sometime.

THE AMARYLLIS FANCIER AND HIS DEALER: Often someone sees an amaryllis that has flowered and made an exceptional specimen. He immediately falls in love with the flower. With some difficulty he finds where he can buy Imported Dutch Amaryllis bulbs at a reasonable price. He purchases two or three bulbs, follows directions and has reasonable success flowering them. This may happen for several years and he enjoys the hobby. After this his interest grows and he wants to see more varieties, colors and types. He then purchases quite a few. With these 10 to 20 bulbs he finds there are some complete failures. He then notices that the bulbs he had purchased for several years before are not flowering either; in fact, they are shrinking and some have disappeared. What is happening!! The first thing he thinks of is that his bulb dealer must have sent him old worn out bulbs. So he writes his dealer. The dealer answers him politely but firmly saying he furnishes the best bulbs obtainable and can not be expected to grow them for the customer. The dealer does not take kindly to his demanding replacement of those bulbs that were failures.

Now the new fan has tasted failure and he becomes frantic. He feels the bulb dealer has not acted properly by not replacing the bulbs.

Next season he will find another bulb dealer who is more "reliable" even if he has to pay more for his bulbs. He orders some from the new dealer. He may have success the first year but eventually the same cycle happens again and he finds himself writing the new dealer. The new dealer tells him the same thing but usually a little more bluntly. At this point he gives up completely and may forget amaryllis for other flowers or other hobby. He may not completely give up. He may only lose interest for a season or so but his experience has mellowed him. He finds himself writing the original amaryllis bulb dealer. He is asking for advice and the venom is gone. The amaryllis dealer will try to advise him as to where he made mistakes and also that everyone has failures. Once he understands that others are experiencing or have experienced failures he has more faith in himself and growing amaryllis becomes a challenge to him.

The belief that amaryllis are easy to grow is wrong. Most dealers try to send out the best bulbs obtainable. The point I would like to make is that most amaryllis imported from Holland, except for a few like 'Apple Blossom,' 'White Giant' and 'Ludwig's Dazzler,' come from the same sources, unless you happen to trade with some unscrupulous firm of which there are few, if any, as there is little money in this industry and that does not appeal to those looking for a quick and easy profit.

The varieties not raised by the originator, such as 'Apple Blossom,' are generally grown by a grower who is equally as good. The bulbs you buy usually come from the same source regardless of the dealer you trade with. The bulbs should respond as well from one dealer as another. The only difference is in the handling of the bulbs after they are shipped from the grower and the service you get. The bulbs can get over heated or be subjected to extreme cold in transit. This will have some bearing on the results and this is usually unknown to the dealer. He has little control over this except seeing that the shipment is not delayed in transit.

The bulbs often have sweated in shipment and once received the dealer must dry them off quickly so as to prevent rot developing and keep the bulbs dry in storage. He should keep them dry until packed and they should be properly packed to keep them from being damaged by cold in transit to the customer. One of the best assurances that the bulbs do not get damaged by cold in transit is that they be throughly cured before they are shipped and are dry when packed. Other than assuring proper handling the dealer can do little to insure you good results. The growing season has a great deal to do with how your amaryllis will respond. The Dutch know their business; however, even with their know-how every amaryllis bulb they produce does not always give satisfactory results.

The Dutch growers grow amaryllis especially for potting and they select seedlings for propagating that will produce a nice looking bulb in a short time and flower well when forced. This is their criterion and

one must realize this means they are interested in giving you a bulb that flowers well the first season. They do not breed for a continuing flowering habit; however they have to pick vigorous clones and many can be maintained in flowering condition year after year. But some just do not respond well after the first flowering season after they are purchased.

I think if you would ask most dealers, and possibly the Dutch growers, they would prefer the customers who buy a few bulbs each year to flower for their own enjoyment and when the flowers are gone they throw the bulbs over the back fence or give them to a neighbor to try to nurse them along. Next season they purchase new bulbs. This type customer figures when the bulb flowers they got their $3.00 to $4.00 worth and they are satisfied. These customers often have the dealer pick out clones that are easy to flower and due to this fact and the fact that they are satisfied to receive the same clones each year they are more successful than the person who makes a hobby of nursing bulbs along from one season to the next.

Do not feel that I am against the hobbyist for I am one myself. But the hobbyist must get enjoyment from the challenge and the growing and accept the failures. If only the flowers fascinate you, stick with a few new worthwhile clones each year and when you get through with them give them to a neighbor who wants to experiment with the bulbs.

HINTS ON CULTURE: To get back to the fan who has begun experiencing failure. His bulbs seem to shrink each year. Whether they are planted in a bed or in a pot makes little difference. From where I sit, if you want to take the trouble to bring them back, here are a few points that might help.

The main reason amaryllis fail is that they lose their roots or just fail to grow them. The Dutch growers when talking of failure say their amaryllis lost their roots. If your amaryllis are doing poorly you will generally find they have few roots during the growing season. What should you do?

First, most root failure is caused by one of the following, in the order I consider most prevalent: 1. Insects and soil borne fungus; 2. A soggy soil, poor drainage; 3. An acid soil; 4. A poor supply of fertilizer.

If you have amaryllis that are doing poorly I would first suggest you dig them and spread them out on a concrete area or other paved surface that is drained. Let them stay in the weather 6 to 8 weeks. The rain and sun will do wonders to clean the bulbs of insects and fungus. After this find a new area for the bed or new potting soil. The soil must be open textured and well drained. If the soil is acid add some lime. I prefer oyster shell as it tends to keep the soil from becoming too heavy. Make the soil rich in organic fertilizer or start a program of providing liquid fertilizer each 10 days to two weeks. You will find when replanted the bulbs will acquire new life.

Now if you do not have the time to repot the bulbs or make a new bed and the soil is suitable, I suggest you get a good miticide such as

Cygon and drench the pot or the bed with a solution in water. After the insecticide has been in the soil several weeks obtain a good fertilizer and make a weak solution and water with it for several weeks but let the bed or pot dry some between each application. This will often start growth.

I suggest you drench your potted amaryllis or beds of amaryllis at least twice a year with a good insecticide. I use Cygon with some success. There might be others that are better. One application in the spring, one in mid-summer and spray the foliage each six weeks between. The insects that hurt are the ones you can not see.

WHERE TO GROW YOUR AMARYLLIS: If you have your amaryllis in a bed, pick a place in the open with tall trees to the west. I feel this is best as this gives them sun in the morning and a little shade to rest afternoon; also the sun will peek through under the trees in the afternoon. They need plenty of sun. You will find the white ones will do poorly unless they get lots of sun and they also appear to like a little more lime.

Often I am asked what size pot to use. This depends somewhat on the nature of the particular clone but will range from 5″ to 10″ according to the care you will take of it. Generally if they are to be set out in the open where watering is not controlled, choose the smaller sizes and you will get best results. I generally use a 5″ to 7″ pot.

Where should you place the pot during the growing season? If you are having luck, keep them where they are. If you have one or two pots you might place them in one of the following spots: (1) on the edge of the border up against other low plants that will shade the pot but allow sun on the foliage, or (2) on a box slightly on the edge of a hedge where humidity will be fairly high, yet ventilation is good. One of the best bulbs I ever had was from a pot set slightly under the edge of border grass. Another pot I had great success with was set on a table where azaleas overhung the pot slightly. They do not like wet feet, but a day or two of rain will often clean insects from the roots, and result in new vigor.

A TABLE FOR YOUR POTTED AMARYLLIS: If you have a lot of pots I would suggest you build a table to set them on. For the top use 1 x 4″ with an air space of about ¾ inch between each board. This will allow air flow through the plants and help keep the roots cool, prevent the pot from becoming too wet, and allow evaporation from below to keep the humidity up. You will find such a table will lead to success. It keeps weeds from growing over into the pots, and helps make caring for them much easier from the back. Use treated lumber so termites do not destroy it. Also nail a sleeper to the legs so it does not mire up in the ground. Set it at the outside edge of the foliage of a tree.

Well, enough advice on growing amaryllis. I do hope you will find some of the comments helpful.

THE 1966 FLOWERING SEASON—GROWING SEEDLINGS: Again getting back to the past flowering season I would first like to

comment on the reports of extra fine blooms from seedlings. Many reported super flowers which they said made some named clones look sick. Now, don't low-rate the named clones. Often the first flower from the seedling is its best and never again will it be the same unless great care is taken in culture. Like other hybrid seedlings the maintenance of color and size requires the best of culture. However you will find some that will improve in future years with ordinary culture. You must remember that the Dutch develop many seedlings of similar color in order to introduce a clone and often it is superceded in 5 to 6 years after introduction. Do not get your hopes too high with your seedlings but if you plant good seed you should get many worthwhile seedlings and most will be worthy and have nice clear colors.

NAMED CLONES: Picotee types in the named Dutch varieties remain very popular followed by the pinks and pink-and-whites. The solid colored clones remain popular but bitones, blends and novelty types gain favor.

White clones: The whites have always been popular particularly with the beginner. And like the Japanese, white flowers have always been a favorite with me. The whites are some of the easiest to force, and they make good clones for the beginner. There are many fine free flowering whites. 'White Christmas' is possibly the most popular. It holds roots well in storage and always gives a good account of itself especially as a pot plant. 'White Giant' is a fine large white that is easy to flower. 'Early White' is a new one that gives great promise. It makes fine large flowers. 'Ludwig's Dazzler,' 'Marie Goretti' and 'Winter Carnival' all perform well. In the exhibition class many say 'Oasis' is tops. Van Meeuwen's 'Mt. Blanc' is also a fine exhibition type. Many of the whites are much alike. The C. Warmenhoven whites, none named, caused many fine comments this past season. They are free flowering and have a beautiful ivory cream color when first open. They are large and handsome and to the breeder for yellow they might prove to be a good seed or pollen parent.

Near White Varieties: The near whites gain popularity. 'Picotee' is most popular. 'Peppermint', 'Marion' and 'Siren of Paradise' in white with a fleck of red are popular. 'Peppermint' has more red. 'Marion' is huge and 'Siren of Paradise' is extra tall and large; fragrant and a wonderful exhibition clone.

Bi-tones And Striped clones: I would like to take up the red and white bitones and stripes at this point. This group has always been weak. Ludwig's 'United Nations' and 'Carousel' are notable. Van Meeuwen's 'Orion' is a vigorous growing large flowering clone. If the color was brighter it would be most outstanding, but it is still worthwhile especially in hybridizing. Warmenhoven's 'King of Stripes' is a fine round flat form, however smaller than most clones.

Pink and White: Pink and white is a good color combination especially for the ladies. 'Apple Blossom' still remains popular; however 'Rose Marie,' 'Pygmalion', 'Rosy Dawn' and 'Love's Desire' (with

a little more color) gain in popularity. All four are fine clones. 'Pygmalion' is earliest and is possibly the most free flowering. 'Artemis' is a new exhibition type that grows tall and large. It should make a name for itself on the show table.

Blended Color Varieties: The blends are popular and many new and worth while clones have been added to this list in the past several years. In shrimp pink and white 'Margaret Rose', 'Sweet Seventeen' and 'Day Dream' are very similar and all are fine. 'Day Dream' is somewhat the largest. Ludwig's 'Gypsy Girl' caused quite a lot of excitement last season. It is large and beautiful.

In orange and white blend 'Golden Triumphator' grows large and is vigorous. 'Cupido' and 'Pinksterflower' are fine but similar. Warmenhoven's 'Catherine Valenti' is exceptionally fine in rose and white with extra large heavy textured flowers. His other clones, 'Television', and 'Mount Everest', although less spectacular, have merit for they lend different color combinations to any collection of blends. 'Floriade,' white and pink, demands top billing and many fine reports are received on it each year. It is fine. 'My Fair Lady' in red and white blend is different, an exciting new color combination.

Beacon is still in a color class of its own being salmon pink and white. It grows large easily. Pink Beauty, a similar variety, in salmon, red and white has fine form. It has more white in it than Beacon.

Pink clones: Ludwig's clones lead the pinks and are about all that are available. 'Heaven Sent' appears to be the favorite. It is a beautiful soft rose pink. 'Dutch Belle', a light rose pink, is second in favor followed by 'Flora Queen' in lavender pink. Clone 101 and 'Sight Show' remain popular. Warmenhoven's 'Little Diamond' is considered by many to be tops in pink; however, it is expensive and not reliable as a substitute for 'Pink Beauty'.

Rose clones: In the rose shades Ludwig's 'La Forest Morton' is a fine light rose and stands out by itself. 'Trixie' is an exceptionally fine formed medium rose red that should be in all collections. 'Violetta', a fine round flat formed violet rose is outstanding and of a color all its own. 'Elvira Armayo', a medium rose lavender, is very large and liked by many. 'Moreno' and 'Bordeaux' still remains the only dark rose reds available.

Reds: Good bold reds are always popular but I find them less dependable than other sorts generally. 'Barbarosa' is a nice bright red. 'Scarlet Leader' holds its roots exceptionally well in storage and is an outstanding free flowering forcing clone. 'Ludwig's Goliath' makes huge flowers and flowers easily. 'Scarlet Triumph' is fine. 'Red Champion' is a popular larger exhibition type. 'Flamboyant' still is sought after. It has exceptionally fine form. 'Mars' and 'Rembrandt' are still favorites in the standard dark reds. Van Meeuwen's new clones, 'Bernice' and 'Queen of the Night', were well received last season. C. Warmenhoven's new dark red, 'President Kennedy', is a fine flower. 'Purple Queen' still remains popular. Ludwig's 'It' is about the darkest red available and a mighty fine new one. 'Mohawk' is the finest

wine red, much like 'Red Master', but with four flowers per scape. Propagation problems keep it off the market so one may have to string along with 'Red Master' although it only makes two flowers per scape.

Salmon clones: There are a number of fine salmons available. 'Rilona' is a soft buff salmon. 'Bouquet' is still one of the finest available. Ludwig's new 'Beautiful Lady', a golden salmon, is exceptionally beautiful and a wonderful color. In still a deeper tone the new 'Hecuba' found favor with many. 'Delilah' is still a fine tangerine colored clone in a class by itself.

Orange clones: Good oranges are still much in demand and there are several that you will find exceptional. 'Orange Orchid' causes the most comment. It is a fine color and appears double. 'Orange Wonder' is still very popular and in demand. Ludwig's 'Home Decorator' is liked by many. 'Mrs. Warmenhoven' is a beautiful new one. 'Cavalier' is possibly the largest in this color.

African Amaryllis: Of the African Amaryllis "Clone 65," a fine scarlet, is possibly the most free flowering. The bulbs shrink a great deal in storage, however this does not appear to affect its free flowering habit. The new 'El Toro' is an exceptionally fine orange. It is a sensational bronze orange that is one of the finest oranges ever introduced. 'Rosedale' in rose still flowers well. 'Rosaline,' a brick rose and white, still flowers easily. "Clone 242" is a fine striped clone that most people like. The African amaryllis are popular and each year they give a better account of themselves.

In commenting on clones one can never cover all the fine ones that are available. Each year when I re-read this article in the Year Book I think of clones I should have mentioned. So if I did not mention the ones you hold in high esteem do not feel that it is inferior. I try only to comment on those that impressed me in the previous season and often it may be that a certain clone bloomed when I was too busy to give it special attention (this often happens). Generally I feel that those I comment on have considerable merit.

SPECIES: Last season I did not collect many new species and like most of us who are interested in species, my interest comes and goes as the temperamental ones fail to respond. Generally I find I neglect the species due to lack of time. I lost many species bulbs due to lack of care during this past winter. You do have to give species special treatment.

When you neglect the species there are some rewards and this is to find the ones that are most adaptable for his particular area. In this regard I would like to comment on those species that do best in North Florida.

Amaryllis aulica var. *stenopetala* will naturalize in the North Florida area. It grows well in the Jacksonville area but needs some winter protection if temperatures drop below 25° F. for any length of time. It grows well. However being summer dormant, our rainfall during this period breaks its dormant period so it seldom flowers. It is a tough large flowering vigorous species and should receive the interest of the breeder.

A. belladonna naturalizes here and other areas in Florida. The past cold winters have not been kind to it. It does best here in well drained sandy areas. An abundance of rain in summer gives it enough moisture to grow. *A. belladonna* grows in low ground along the Amazon River where the average temperatures are in the 70° F. range. In areas where winter temperatures are lower it has to have a well drained location so it does not succumb to the cold wet condition. I have found *A. belladonna* is more adaptable to acid soil than other species. I have had luck in growing it in boxes of peat. It takes large quantities of water in summer where temperatures are above 70° F. at night. If night temperatures are lower it must be kept drier to prevent cold damage. I feel *A. belladonna* can be grown successfully in pots if you can keep it well watered and above 70° F. at all times. If you do let it go dormant let it be dry and never below 50° F.

A. striata will naturalize in lower Florida, however it rots easily if given a cool wet condition. It should be kept in an evergreen condition for best results. If you wish to let it go dormant dig it in a green condition, clean the bulbs and keep in a dry state above 60° F. It is a very successful pot plant and will thrive in a large pot. One should give the pot an insecticide drench especially in the south to eliminate mites and other root attacking insects. If the leaves of your plant show modling it more than likely indicates insect trouble on the roots. *A. striata* is very susceptible to insect damage but it is a wonderful plant that makes off sets at a rapid rate and with one bulb you can have several hundred in a few years if properly taken care of. The species SA 62-22 collected from Armacao near Itajai, Santa Catarina at sea level is the most robust of the forms of *striata* I have found. The flowers are medium size 3 to 4″, very vigorous and appear to stand more extremes in temperature and other conditions than other forms of *striata* which I have. I have made several crosses using this form and Dutch strain amaryllis. I believe it is *A. striata* var. *striata*. I have another large flowering form of *striata* from the Island of Santa Catarina which is not hard to grow. Hybrid form SA 63-22 should prove interesting to the hybridizer as it is more insect resistant than other forms of *striata*.

Another species that has done well in the Jacksonville area is SA 63-16 from Teofilo Otoni, Minas Gerais. It grows in full sun on rocks in the wilds. I have it planted in sandy soil. It grows rather vigorously. The few flowers I have had have been of a rather muddy peach color but very large and airy. The flowers were up to 7″, tepalsegs fairly narrow but fairly uniform in width. It has a small stem, about 3 8″; however the bulbs have gained considerably in size during this past season and I expect larger flowers next season. It should make a good hybridizing subject for developing amaryllis hybrids for the Florida area.

Before I close there is one lot of species bulbs I collected last season I would like to comment on. This is Lot SA 65-23. These were collected at Figueira, near Pedreira, Santa Catarina and are called Acucena

gigante. It flowers in the wilds in October/November. Where it grows it has a temperature range of 5 to 32° C. It grows on rocks under trees. This lot of bulbs contained three different species. One appears to be a type of *A. aulica*. Only a few of these were in the lot. The others appear to be *A. reticulata striatafolia* and *A. reticulata*. The *reticulata* has a fine white stripe down the center of the leaf which is leathery dark green. The flower was white and purplish, red striped. I have been told by people who have traveled in South America that they have seen this species growing in the mountains, and that it makes large plants with wide leaves 3 feet or more tall. Possibly this is where it gets the name "Aeucina gigante". It appears to grow best during cool weather. Those traveling reported that they saw it in the mountains when the weather was chilly. I tried to make mine go dormant last fall and lost most of them. The ones that did not die did not start growth again until September. I plan to keep them evergreen this winter. I assume they will be much like 'Mrs. Garfield' and prefer a fall growing period with a mid-summer or early fall-flowering period. This should prove to be an interesting species but I feel it should be grown as an evergreen or winter growing sort.

I expect to get several new lots of species from new areas of Brazil this winter. Like most fans the species fascinate me but as a commercial adventure they are a failure. Possibly when I retire in several years I will have additional time to care for them and can put them to good use in developing new hybrids which has always been my hope.

ASEXUAL PROPAGATION OF **LYCORIS**

E. G. Corbett,

Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, Glenn Dale, Maryland.

Although a great deal has been written about propagation of various members of the Amaryllidaceae there is very little in the literature on techniques of propagating *Lycoris*. The usual procedure apparently has been to depend on natural increase of the bulbs or the production of offsets. Recently, the supply of bulbs has largely depended upon imports of bulbs collected from the wild in Japan. Natural vegetative reproduction has been completely unsatisfactory with some species, notably *L. chinensis*, P. I. 162443. Twenty-five bulbs of this plant were introduced by the USDA in 1948 and sent to the U. S. Plant Introduction Station, Glenn Dale, Maryland. The bulbs have produced no daughter bulbs during 17 years at Glenn Dale. This condition, and the fact that most dealers list only 1 or 2 of 17 known species (5), suggested the need to determine some means of propagating *Lycoris* more rapidly.

The standard methods of propagating other members of the Amaryllidaceae have been thoroughly covered in numerous publications such as Plant Life (2), and it would be of no value to recount them here. Taxonomic and popular articles have frequently referred to the close

affinities between *Lycoris* and *Amaryllis* (1, 4). Morphologically the bulbs of *Lycoris* are quite similar to bulbs of *Narcissus* and *Amaryllis*, so similar that they may be easily confused. Therefore it was believed that the methods of propagation used with the two latter genera might be applicable to *Lycoris*. This belief was strengthened by the comments of Caldwell (3) regarding asexual propagation of *Lycoris*. The genus *Lycoris* may be separated quite readily, however artificially, into two groups: those species producing leaves during fall and winter, and those producing leaves in spring. The species all flower during mid to late summer and early fall.

MATERIALS AND METHODS

Bulbs of *L. radiata* P. I. 227995 (leaves produced in fall) and *L. incarnata* P. I. 130621 (leaves produced in spring) were dug on July 20, 1964. These species were selected to represent the two categories based on the time of appearance of the leaves. The bulbs were dried and held until November 7, 1964, at which time they were used in propagation experiment. The treatments were: (1) scooping of the basal plate to approximately two-thirds of the depth of the plate, (2) cross cutting the basal plate into 4 equal segments, (3) sectioning of the bulbs into halves and quarters, and (4) no treatment. The propagules were dusted with a 2:1 mixture of Hormodin #1 and Fermate and allowed to dry for 2 days to promote suberization of the wounded surfaces. The propagules were planted in sand in a greenhouse bench and watered as needed throughout the experiment. The plants were removed from the bench on June 14, 1965 and the results tabulated. The bulbs resulting from the test were planted in a cold frame outdoors to determine the length of time required to develop to flowering size.

RESULTS

The results of the various treatments with both species tested are shown in Table 1. There was a marked increase in the number of bulbs with all treatments involving division of the bulb. Scooping of the basal plate resulted in a slight increase in bulbs, with *L. incarnata* showing the greater response to this treatment. The additional bulbs were the result of splitting of the treated bulbs rather than the production of

Table 1. Results obtained from propagation treatments with 2 **Lycoris** species.

Treatment	No. of Bulbs	Propagules	No. Rotted	Propagations	Percent increase of bulbs
L. radiata 227995					
No treatment	85	85	0	89	4.7
Scooped	85	85	9	88	3.5
Cut	84	84	8	156	85.7
Sectioned ½	39	78	20	63	61.5
Sectioned ¼	37	148	78	79	113.5
L. incarnata 130621					
No treatment	41	41	0	41	0
Scooped	45	45	0	61	33.3
Cut	45	45	0	114	153.3
Sectioned ½	15	30	1	34	126.6
Sectioned ¼	28	112	25	93	232.1

small bulblets as is usually the case with scooping. Table I also shows that the rotting of the propagules was in direct relation to the degree of injury. The loss of propagules through rotting was most severe when the bulbs were sectioned into quarters. These results indicate that division of the basal plate or sectioning of the bulb will promote the production of new bulbs.

DISCUSSION

The results give the impression that, under the conditions of this experiment, methods involving severe wounding, such as cutting the basal plate or sectioning the bulb, are useful in providing a rapid increase in bulbs of the species tested. Although the number of propagules which rotted was much greater when the bulbs were quartered, the net result was still a greater increase in bulbs than by any other method. It is possible that improved techniques during suberization could reduce or eliminate the rotting of the propagules.

Comparison of the sizes of the bulbs as depicted in Figure 48 clearly shows that the smallest bulbs resulted from sectioning. It still must be determined whether these small bulbs can be grown to flowering size within a reasonable period. Another factor that must be considered is field survival of these smaller bulbs. The bulbs have been set in a cold frame and an evaluation of these considerations should be forthcoming.

Fig. 48. Comparative sizes of bulbs of **Lycoris incarnata** resulting from the several propagations: sectioned, ¼ and ½; cut; scooped and control. See text and Table 1.

Additional tests with other species must also be undertaken to ascertain whether the techniques are applicable throughout the genus. The timing of the treatments should also be investigated as there is no information on this vital subject. This can be especially important with a plant like *Lycoris* which produces leaves at one season and flowers at another. The cultural requirements of the propagations should also be determined. Again there seems to be no information on this subject, yet herein may lie the answer to the erotic performance of several species as frequently reported (3, 4).

The present results, however, provide evidence that cutting the basal plate or sectioning the bulb will result in a substantial increase in the number of bulbs of *L. radiata* or *L. incarnata*. The untreated bulbs produced almost no new bulbs; the technique of scooping was not much more productive. It should be possible to adapt these methods to field

production thus increasing the availability of bulbs of the several species. This greater availability might help to popularize an ornamental genus which appears to be more widely adapted than has generally been recognized.

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A PRIMITIVE AMARYLLID—HANNONIA HESPERIDIUM

L. S. Hannibal, *4008 Villa Court, Fair Oaks, California 95628*

Attempts to key out *Hannonia hesperidium* fail due to its being one of the most primitive Amaryllids in existence. In plant identification we generally overlook the past ecological histories of an area, but past Arctic

Fig. 49. **Hannonia hesperidium** Braun.-Blanq. & Marie, the amaryllid from Morocco, as grown by L. S. Hannibal, Fair Oaks, Calif. The rule in background is 6 inches long.

and Antarctic ice ages are powerful factors in effecting some change in the climate—all of which causes plants to migrate or to progressively adapt to slowly changing conditions. As a consequence there are few places where plants can survive for several million years without major change but the west coast of Morocco and Spanish West Africa can be so rated, and this is particularly true of the Hercules Peninsula where *H. hesperidum* is localized.

In general morphology *Hannonia* resembles *Sternbergia*, but with petals and other essential parts reduced by desert conditions to a mere vestige of the *Sternbergia* we know. True the plant could be a primitive *Pancratium* or *Narcissus* but there is no evidence of a membrane or cup, and the hard gritty black seed rules out the suggestion of several genera like *Zephyranthes*.

In growth habit the plant resembles a small *Sternbergia lutea*. The first watering in September brings the plant into instant flower and the foliage soon follows. The plant is adaptable to the coast of California but the white flowers are so completely insignificant and short lived that it would never have garden interest.

ADDENDA

The writer notes several articles including that of Dr. Fernandes which relates *Hannonia* to *Leucojum*. Unfortunately there are several distinct morphological features which appear in decided conflict and unless different plants are involved there is good reason for the writer to consider his material, which was received from Gattefosse of Cassa Blanca, to be related to an early form of *Sternbergia*, wherein *Hannonia* is reduced to the bare essentials of *Sternbergia* due to the arid habitat.

First the blossoms of *Hannonia* have a very distinct linear tepaltube some 10 mm. in length by 3 mm. diameter. Secondly the tepals are all equal and linear, being some 14 mm. long x 2 mm. wide. They are keeled on the exterior by a very slender pale green midrib. The filaments are white, spreading uniformly like a *Sternbergia*, are about 10 mm. long and are of the same length as the style. The scape is solid, two edged, and the seeds are a shiny black, elliptical in shape and about 2½ mm. in length when fresh but rapidly dry down to a shriveled pellet.

In *Leucojum* there is a bare suggestion of a flared tepal tube in Subgenus *Acis*. Tubes are lacking in the others and allied genera. No *Leucojum* has linear perianth segments and F. C. Stearn identifies the segments as being distinct from one another.

[EDITORIAL NOTE.—Mr. Hannibal uses only data from gross morphology in determining relationship but data from as many disciplines as possible, chromosomes, embryology, chemistry, etc., in addition to gross morphology are required in reaching a scientific conclusion.]

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Fig. 50. Welder Wild Life Refuge: **upper:** entrance; **lower:** Main building. Photos by F. B. Jones.

THE WELDER WILDLIFE REFUGE AND ITS AMARYLLIDS

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Only a few associates of R. H. Welder, owner of one of the largest cattle ranches in South Texas, knew that at his death the choicest natural area of his ranch would be retained as a place for the study of wildlife.

Mr. Welder died in 1953. It was his desire and purpose, as stated in his will, "to further the education of the people of Texas and elsewhere in wildlife conservation" and to provide a place where wildlife research could be carried on. By a devise of his will, the Rob and Bessie Welder Wildlife Foundation came into being and a 7800-acre tract of nearly virgin land lying along the Aransas River northeast of Sinton was set aside for its use. This acreage was to be a wildlife refuge, but not strictly a wildlife sanctuary.

In 1955, Dr. Clarence Cottam, formerly Asst. Director of the U. S. Fish and Wildlife Service, became the first director of the Foundation and Mr. Caleb Glazener, previously head of research for the Texas Game and Fish Commission, his assistant. During the first few years, much attention had to be given to the providing of adequate facilities for the students and others who would be coming to the Refuge to work and study. Surveys had to be made, roads making all parts of the area accessible built and artificial lakes dug to insure that the wildlife would not suffer in times of drought. For the headquarters, an open area surrounded by mottes of Live-Oak was selected and a fine building in Spanish colonial architecture erected. In it were well-equipped biological laboratories, a specimen room for scientific collections, a library, a museum for the display of native wildlife, a lecture hall and offices for personnel. Nearby were built a splendid dormitory for the use of resident students and visitors, a screened rotunda for group activities and beautiful homes for the director and assistant director.

By the beginning of 1961, the physical improvements, except the paving of roads, were near completion and in April, a formal dedication was held. It was a gala event with hundreds of invited guests from Texas and beyond in attendance. Many persons well known in nature, wildlife and conservation fields were there.

Long before the dedication, however, the Foundation had begun a program of research and education. From far and near came qualified graduate students holding Welder Foundation fellowships or grants-in-aid to carry on research for their dissertations. By 1966, scores of students had worked extensively on the Refuge and of course other researchers had been there too. The investigations dealt primarily with wildlife and its environment and ranged from studies of fish, snakes, gophers and ground squirrels to soil types, range grasses, predator-

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Fig. 51. Welder Wild Life Refuge: **upper:** Encino Lake, photo by F. B. Jones; **lower:** wild turkey, photo by W. C. Glazener.

prey relationships, feeding habits of deer, turkey and javelina and the nesting habits of waterfowl.

The program of educating the people of Texas and elsewhere took many forms—presentations before clubs, releases to newspapers, articles in periodicals, pamphlets and even book-size publications. Youth groups came to spend a day or night on the grounds while high school and college biology classes made field trips to the area. Every Thursday afternoon there was a conducted tour of the Refuge for the general public.

My first visit to the Refuge was in the spring of 1958 when a club I belonged to was shown over the area by Dr. Cottam. Black brush *(Acacia rigidula)* was blooming, its spiny branches crowded with white or cream-colored spikes. Mesquite was putting out its feathery leaves. Here and there in open areas were patches of wildflowers just coming into bloom—Indian Paintbrush *(Castilleja indivisa),* Bluebonnet *(Lupinus subcarnosus* and *L. texensis), Phlox* and *Coreopsis,* to mention a few. The road led down to the river where there were tall Cedar Elm, Hackberry, Anacua *(Ehretia anacua)* and other trees, some of them draped in Spanish Moss *(Tillandsia usneoides)* or supporting giant Mustang Grape. From there we drove perhaps 5 miles over winding roads between mottes of Live-Oak and across a grassy prairie, finally arriving at an area of natural lakes. Circling in the sky was a bird of prey and Dr. Cottam, always on the ready for accurate identification, pronounced it Sennet's White-Tailed Hawk, mentioning that at one time it was common in South Texas but was now becoming scarce and that he knew of a nest on the Refuge. Driving back to the gate in late afternoon, we passed scores of grazing deer and occasional flocks of wild turkey. A lone coyote crossed the road ahead of us.

Since that first visit, I have been on the Refuge many times and have become fairly well acquainted with its vegetation. Over 700 species of flowering plants and ferns representing more than 90 families have been found to date. Around 5000 species are known from the entire state of Texas, so considering that the Refuge is only 7 miles long and averages less than 2 miles in width, it obviously is rich in species. The explanation is the great diversity of habitats. In the river, lakes and ponds and along their edges are aquatic and other moisture- loving plants. Near the river are shady woods harboring species not found elsewhere. Beyond the woods are areas of sandy and loamy soils, some of them loose and deep and covered with grasses and wildflowers, others heavier and supporting Live-Oak, Mesquite and brushy vegetation. A considerable part of the Refuge is a clay prairie with scattered clumps of brush and a profusion of grasses. There are also swales where water stands for days after a rain, and sloping grounds, bluffs and ravines.

The Amaryllis Family is well represented but the populations often go unnoticed because usually, they are mixed with many other plants that tend to obscure them. Twelve species or varieties have been recorded and it is unlikely that more than one of the remaining six species known from this part of Texas will be found here. Generally, the

Amaryllids may be recognized by their linear leaves, leafless stems (scapes) and flowers having 6 tepalsegs and 6 stamens.

KEY TO GENERA

1a. Umbel 1-flowered, by reduction:
  2a. Perigone declined; stamens and style fasciculate, declinate-ascending ..... HABRANTHUS
  2b. Perigone erect; stamens and style erect or ascending ... ZEPHYRANTHES
1b. Umbels few- to many-flowered:
  3a. Tepalsegs 80-110 mm. long, linear ..... HYMENOCALLIS
  3b. Tepalsegs less than 12 mm. long, lanceolate, ovate or elliptic
    4a. Leaves onion-flavored ..... ALLIUM
    4b. Leaves bitterish, not onion-flavored ..... NOTHOSCORDUM

HABRANTHUS. RAIN LILY. COPPER LILY.

H. texanus (Herb.) Steud. *(Zephyranthes texana* Hook.)

Opening in the morning, scentless; perigone usually 2.5-3 cm. long, funnelform, reddish orange outside, orange-yellow within. Frequent on sandy or clayey loams. June-November. Widespread in Texas.

ZEPHYRANTHES. RAIN LILY.

1a. Flower sessile or rarely with a minute pedicel
  2a. Perigone white ..... **Z. herbertiana**
  2b. Perigone yellow ..... **Z. jonesii**
1b. Flower pedicelled
  3a. Perigone white ..... **Z. drummondii**
  3b. Perigone yellow
    4a. Tepaltube about 5 mm. long ..... **Z. pulchella**
    4b. Tepaltube 1.2-2 cm. long ..... **Z. refugiensis**

Z. herbertiana Dietr. *(Z. brazosensis; Cooperia drummondii)*

Opening near sundown, white, very fragrant, tepaltube 6.5-10 cm. long; tepalsegs mostly about 2 cm. long. Frequent on most soils, sometimes in swales. June-October. Common over a large part of Texas.

Z. jonesii (Cory) Traub

Opening in mid-afternoon, light, yellow, fragrant; tepaltube usually 3-5 cm. long; tepalsegs mostly 1.5-2.5 cm. long. Frequent on the more poorly-drained soils, often in swales. July-October. An endemic of South Texas, known mostly from San Patricio and Refugio Counties; the type locality is about 18 miles south of the Refuge near Taft.

Z. drummondii D. Don *(Cooperia pedunculata)*

Opening in mid-afternoon, white, intensely fragrant; tepaltube about 4 cm. long; tepalsegs mostly 3.5-4 cm. long. Abundant on better-drained sandy and clayey loams on the Refuge. March-May. Widespread in Texas.

Z. pulchella J. G. Smith

Opening in the morning, orange-yellow, slightly fragrant; tepalsegs mostly 1.5—2.5 cm. long. Localized in swales on the Refuge. July-November. It ranges over South Texas from Victoria to Gonzales, Del Rio and Brownsville. The type locality is at Corpus Christi, about 25 miles south of the Refuge.

Z. refugiensis F. B. Jones

Opening in mid-morning, medium yellow, pleasantly fragrant; tepalsegs 1.8-2.5 cm. long. Known from a swale on the Refuge and perhaps not abundant. July-November. It is endemic to Refugio, Goliad and San Patricio Counties. The type locality is about 16 miles northeast of the Refuge near the city of Refugio.

HYMENOCALLIS. AMERINDIAN CHALICE LILY.

H. galvestonensis (Herb.) Baker *(H. liriosme)*

Leaves mostly 3-4 cm. wide; scape to 75 cm. tall; umbels 4-11-flowered; tepaltube 7-8 cm. long; tepalsegs 8-11 cm. long; staminal cup 2.5-3.5 cm. long; filaments 2.8-3.5 cm. long. Fairly frequent on low grounds subject to periodic flooding, mostly near the river. April-May. It ranges from Kleberg Co., Texas to Okla. and Ark. Interestingly, the Welder Refuge and other populations in South Texas are closer in some particulars, as in filament length, to *H. caroliniana* (L.) Herb., a S. E. U. S. species ranging as far west as Louisiana.

ALLIUM. WILD ONION.

1a. Bracts of the spathe 3-7-nerved; tepalsegs withering away as the capsule matures
  2a. Bulb without a cluster of small bulblets at base
    3a. Tepalsegs pink or lavender ..... **A. canadense** var. **ecristatum**
    3b. Tepalsegs white ..... **A. canadense** var. **fraseri**
  2b. Bulb with a cluster of stalked bulblets at base ..... **A. elemendorfii**
1b. Spathe-valves 1-nerved; tepalsegs drying and persisting on the mature capsule ..... **A. drummondii**

A. canadense L. var. *ecristatum* (M. E. Jones) Ownbey

Umbels mostly 8-20-flowered; tepalsegs 5-9 mm. long, pink, lavender or pale purple. Locally abundant, mostly on tight sandy loam. March-April. It is endemic to South Texas, known from a few stations lying roughly between Corpus Christi, Victoria and Floresville. The type locality is about 12 miles northwest of the Refuge near St. Paul.

A. canadense L. var. *fraseri* Ownbey

Umbels mostly 25-75-flowered; tepalsegs 5-6 mm. long, white. Known from the Refuge by a few small patches on tight sandy loam (F. B. Jones 6142, April 17, 1964). It ranges widely in Central Texas and northward and apparently has not previously been reported from so far south. Resembling it, but usually pink or lavender and often with a basal bulblet or two, is var. *mobilense* which occurs about 15 miles to the northeast and slightly farther away to the southeast. It may eventually be found on the Refuge.

A. drummondii Regel

Umbels mostly 10-20-flowered; tepalsegs 5-8 mm. long, white, pink, lavender or purple. Fairly common on better-drained sandy loams and clays. March-April. It is a wide-ranging species.

A. elmendorfi M. E. Jones ex Ownbey

Umbels mostly 15-25-flowered; tepalsegs about 5 mm. long, white or sometimes pinkish or lavender. Abundant on deep sands. March-April. It is endemic to South Texas, the few stations for it lying roughly between Corpus Christi and Elmendorf (just south of San Antonio.)

NOTHOSCORDUM. FALSE GARLIC

N. bivalve (L.) Britt.

Flowers opening near noon, white, fragrant; umbels mostly 6-11-flowered; tepalsegs usually 8-19 mm. long. Frequent on various soils on the Refuge. Flowering all year, but mostly March-June and September-October. Widespread in Texas.

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Trust Provisions from the Will of R. H. Welder Creating the Rob and Bessie Welder Wildlife Foundation. Mimeo.

NEW PUBLICATION

Lee Moore's Armchair Adventurer, Vol. 1, No. 1. Jan.-Feb. 1965 has been received. This first number of the new publication, founded and edited by the plant explorer, Mr. Lee Moore, P. O. Box 504, Kendall, Florida 33156, is dedicated to the memory of Ronald Wagner, who lost his life in an airplane crash while searching for new plants. The new periodical is devoted to the exploration for plants in the Amazonian jungles. Those interested in subscribing to this publication should write directly to Mr. Moore.

A WHITE GLORIOSA FROM AFRICA

SYDNEY PERCY-LANCASTER,

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Since visiting Africa (see previous issues of Plant Life) I have been particularly interested in two genera—*Gloriosa* and *Sansevieria*. Of the former, a Bulletin (No. 123) has been issued by the National Botanic Gardens, Lucknow, in which are mentioned varieties collected by my son and self. Africa seems to produce the solitary *Gloriosa superba;* Africa has dozens. I brought back a few unnamed varieties of *Gloriosa* at the end of 1963, but only one has proved worth while waiting for it to get acclimatized. Caterpillars took advantage of casual supervision by an overseer and damaged the plants in 1964 and 1965. The entire collection was shifted to a new site and this new variety has been spared to grow to its full height and develop more than the solitary flower it bore last year. The variety has been named 'White Queen'. While it is certainly allied to the Carsonii Group, due to the arrangement of the foliage, the shape of the flower and the leaf is distinct.

Gloriosa—'White Queen'

Length of stem—15 feet.
First basal leaf—2 feet from ground.
Arrangement of foliage—irregular and occasionally alternate.
Leaf measurement—5" by 1¼", including tendril 1" long; some leaves on main stem 6½" by 2".
Leaf color—dull green, under surface shining.
Leaf shape—oval, acute.
Flower bud—yellowish green, opening at the base.
Flower—length, 2"; width, 2½", erect.
Petals—2" long, ⅝" wide, edges undulating.
Flower color—palest creamy white, with greenish base and dark maroon dots; fading to white with yellowish flush on the back of the petals, and to dead white on the second day.
Pistil 1½" long, stamens 1¼" long.
Number of flowers to the plant—approximately 25.
Flower pedicel—5" to 7" long.

KNIPHOFIA PRAECOX IN THE DEEP SOUTH

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The "discovery" of this "new", December flowering "Torch Lily" by the writer was more or less accidental. It came about through the receipt of a complimentary package of seed of the variety 'Winter Cheer' from R. E. Harrison & Company of New Zealand.

The seed germinated quickly and the seedlings grew lustily in a good loam soil in the open ground. After two years the plants bloomed in December, with fiery or flaming red spikes which were four feet tall and which stood out like sentinels in the garden.

A number of varieties of *Kniphofia praecox* are now available. 'Winter Cheer' has 9", orange-scarlet torches on stems which are 3 to 4 feet tall. Each spike holds its color during the entire month of a frost-free December. The foliage of this plant is hardy in the Gulf Coast Region, but since freezes frequently come in December, it is advisable to grow the plants in 8" pots which may be brought inside to protect the flowers from an over-night freeze.

Vegetative increase is rapid. The clumps may be divided after flowering and the divisions reset for bloom the following winter.

PLANT LIFE LIBRARY

PROCESSES OF ORGANIC EVOLUTION, by G. Ledyard Stebbins. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. Concepts of Modern Biology Series. 1966. pp. 191. $2.50. Professor Stebbins is an expert in the field of evolutionary studies having done much significant and original work as a student of evolutionary processes. Furthermore, Prof. Stebbins probably has a better command of the literature than any investigator now active in this demanding field. Familiarity with the literature permits him to pinpoint relevant examples from his own work and that of others for discussion and interpretation of specific problems.

There is no question about the niche this little volume (191 pages) is designed to occupy as Prof. Stebbins makes clear in the Preface. Essentially he proposes the book should: (1) serve to acquaint students and professional biologists in other fields with the "hows" and "whys" of evolution; and (2) serve as a basic platform for stimulating new advances into this fascinating field.

Reading this book is a rewarding experience. Stebbins writes well. His prose is trenchant, lively, and sparkles with pertinent analogies drawn from contemporary life. There is a pleasing absence of technical jargon, and where necessary to use such terms their meaning is carefully explained (sympatric vs. allopatric, pg. 94). The text is illustrated with an abundance of good figures, graphs, diagrams and photographs. It is a relief to read a scholarly book where subject matter and illustrations are so well integrated they occur on the same page. Teachers will find the Chapter Summary and the Questions for Thought and Discussion at the end of each chapter valuable aids in presenting the scope and meaning of evolution to their students.

There is little that can be faulted in this book; even the typographical errors are at a minimum. Confronted with this situation, the reviewer is reduced to making minor criticisms that have no bearing on the content, accuracy, or usefulness of the book. For example, the analogy on page 3 in my opinion is poorly chosen. The analogy of a group of evolutionary lines changing through time with an automobile being driven along the highway seems cumbersome and slightly exaggerated. Also, certain of the figures (e.g. Fig. 6-5) are not documented either in the legend or the text. This could be distracting to the motivated student seeking further information. Perhaps more copious references would have been an improvement, but this feature would have added materially to the length and cost of the book.

In a final chapter Prof. Stebbins analyzes what is known about the evolutionary processes in man, and boldly speculates on their meaning for the future of *Homo sapiens*. Sociologists, and even some geneticists are not likely to agree with his ideas, but they should stimulate some enlightening discussion in this important field.

For a lucid, concise discussion and explanation of the processes of organic evolution this little book is not likely to be surpassed, now or in the immediate future. In fact, it might well become a classic in this area.—*Thomas W. Whitaker*

PLANT LIFE LIBRARY—continued on page vi.

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For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Morton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

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REVIEW OF THE GENUS NERINE

by

Hamilton P. Traub

1967

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REVIEW OF THE GENUS **NERINE** HERB.

HAMILTON P. TRAUB

I. BRIEF HISTORY, 1820-1966

The story is told that a trading ship was wrecked off the British Channel Islands and that among the wreckage that washed-up on the shores were bulbs from a foreign land which took root and thrived. Thus, apparently before 1700, a plant commonly known as the "Guernsey Lily" had been naturalized on the Island of Guernsey (Latin,—Sarnia) through the agency of the early traders. At that time, the South African habitat of the plant was unknown. When Linnaeus published "Species Plantarum" in 1753, he included it under the name, *Amaryllis sarniensis* L. (=Amaryllis of Sarnia). In the same year, Heister (Braunsvig. 20. 1753; 1755) had placed this plant under the generic name, *Imhofia* Heist. Herbert later ignored Heister's name, and first proposed *Galatea* Herb. in 1820, a later homonym, which he subsequently replaced it with *Nerine* Herb. (Bot. Mag. Pl. 2124. 1820). This was later conserved over the earlier *Imhofia* Heist. Thus, the species are now grouped under the later name, *Nerine* Herb. (nomenifer, or name-bearer, the species *Nerine sarniensis* (L.) Herb.).

In a later edition of "Species Plantarum", the species *Amaryllis undulata* L., was proposed which was referable to *Nerine*. The great naturalist, Nicolaus Joseph Jacquin (1727—1817) proposed four additional species which were referable to *Nerine*—*Amaryllis marginata*, *A. curvifolia*, *A. humilis*, and *A. flexuosa*. *Amaryllis corusca*, *A. venusta*, and *A. laticoma* were added by Ker-Gawler.

In 1821, Herbert recognized nine species—*Nerine curvifolia*, *corusca*, *rosea*, *venusta*, *sarniensis*, *flexuosa*, *humilis*, *undulata* and *pulchella*. In 1837, Herbert again listed nine species, but unfortunately he placed *N. sarniensis* under *N. venusta* as a variety as shown in Table 1.

Baker, in 1888, admitted 10 species, and by 1896, he listed fifteen species as shown in Table 1.

From 1896 to 1966, twenty-one species have been added. Of these, nine, including two varieties later raised to specific rank, were proposed by Winsome F. Baker. Another five species were described by L. Bolus, and one each of the remaining seven species were proposed by various other authors. Thus, as of 1966, thirty-six species were recognized. This number has been reduced to thirty in the present review. Others apparently remain to be discovered. However, it has to be realized that some of the species now recognized, after critical study, may be reduced to synonymy or to subspecific rank.

The biological Latin name, *Nerine*, is from the Greek, *Nereis*, the name of a sea-nymph. The so-called Roman pronunciation of Latin aims to represent approximately the pronunciation of classical time: *e* as in *pet*; *i* as in *machine*. Words of more than one syllable are accented on the penult (=last syllable but one) if that is long. Thus, *Nerine* would be

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pronounced *ne-ree-ne*. But Roman names in common usage today are sometimes pronounced with ordinary English sounds, *i* as in *ice*. Thus, it would be pronounced *ne-rye-ne*. This is altogether too harsh for a flower named for a sea-nymph. Thus it is clear that the pronounciation should follow the classical Latin, *ne-ree-ne*.

Table 1. The species of **Nerine** according to Herbert (1821) and (1837).

SPECIES AS OF 1821

1. **curvifolis** (Jacq.) Herb. Bot. Mag. 725
2. **corusca** (Kew-Gawl.) Herb. Bot. Mag. 1089
3. **rosea** Herb. Bot. Mag. 2124
4. **venusta** (Kew-Gawl.) Herb. Bot. Mag. 1090
5. **sarniensis** (L.) Herb.
6. **flexuosa** (Jacq.) Herb. Bot. Mag. 172
7. **humilis** (Jacq.) Herb. Bot. Mag. 726
8. **undulata** (L.) Herb. Bot. Mag. 369
9. **pulchella** Herb.

SPECIES AS OF 1837

1a. Perigone regular; filaments and style fasciculate, straighter:
  2a. Umbel centripetal:
    1. **marginata** (Jacq.) Herb.
    2. **curvifolia** (Jacq.) Herb. Bot. Mag. 725
    3. **corusca** (Ker-Gawl.) Herb. Bot. Mag. 1089
  2b. Umbel centrifugal:
    4. **venusta** (Ker-Gawl.) Herb. Bot. Mag. 1090
      var. **sarniensis** (L.) Herb. Bot. Mag. 294
      var. **rosea** (Herb.) Herb. Bot. Mag. 2124
      var. **minor** Herb.
1b. Perigone distorted; filaments and style curved upwards:
  3a. Umbel centripetal:
    5. **flexuosa** (Jacq.) Herb. Bot. Mag. 172
    6. **pulchella** Herb. Bot. Mag. 2407
    7. **lucida** (Bureh.) Herb. Bot. Mag. 2124
  3b. Umbel centrifugal:
    8. **humilis** (Jacq.) Herb. Bot. Mag. 726
    9. **undulata** (L.) Herb. Bot. Mag. 369

Table 2..The species of **Nerine** according to Baker (1896).

1a. Scape long, slender:
  2a. Tepalsegs, stamens and style nearly erect:
    1. **sarniensis**
    2. **curvifolia**
    3. **moorei**
  2b. Tepalsegs, stamens and style declinate:
    3a. Filaments not distinctly appendiculata at the base:
      4. **flexuosa**
      5. **angustifolia**
      6. **pudica**
      7. **brachystemon**
      8. **filifolia**
      9. **undulata**
      10. **humilis**
    3b. Filaments distinctly appendiculata at the base:
      11. **appendiculata**
      12. **paneratioides**
1b. Scape short, stout:
      13. **lucida**
      14. **duparquetiana**
      15. **marginata**

The present review of the genus *Nerine* Herb., is a lineagic treatise and is excerpted from the large text of all the *Amaryllidaceae* on which the writer has been working for over a half century. It is reproduced at this time at the request of members of the Society interested in Nerines and will tide them over until the monograph of Prof. Ken Douglas of Kingswood College, Grahamstown, South Africa, can be completed and published. Such a monograph can include also details on breeding, culture, pest control, etc.

II. THE GENUS **NERINE**

Genus NERINE Herb.,

Bot. Mag. pl. 2124. 1820; App. 18-19. 1821; Amaryll. 283-287. 1837; Bak., Gard. Chron. 779-810. 1885; Amaryll. 99—103. 1888; Fl. Cap. 208—215. 1896.

Syn.—*Imhofia* Heist., Braunsvig. 20. 1753; 1755; *Galatea* Herb., Bot. Mag. sub pl. 2113. 1820; *Laticoma* Raf., Fl. Tellur. 4: 12. 1836 (1837); *Loxanthes* Salisb., Gen. Pl. 117. 1866.

Bulb tunicated, sometimes continued into a neck; *leaves* tongue-*shaped* (lingulate), or linear-lorate, or linear, or subterete, or filiform, synanthous or hysteranthous; *scape* robust, or slender; *spathe-valves* 2, variously shaped; *umbel* few- to many-flowered; *perigone* fairly regular to markedly irregular, variously colored white, red, pink, magenta, mauve, wine-red, etc.; *ovary* 3-valved, ovules few per cell; *tepaltube* short or very short; *tepalsegs* subequal or equal, variously shaped, hardly at all or more or less crisped; *stamens* suberect or declinate-ascending, 3 shorter than the other 3, filiform, usually thickened at the base, or appendiculate, or alternating with scales, or forming a staminal cup, at the base; anthers oblong, dorsifixed, versatile, *style* filiform, straight, or declinate-ascending, stigma simple or 3-lobed; *capsule* membranous, loculicidally 3-valved, variously shaped, often rupturing by the expansion of the maturing seeds; seeds few per locule, globose.

Range.—southern Africa: Republic of South Africa (R. S. Afr.), Botswana, Lesotho, and Swaziland. One species is naturalized on the Island of Guernsey.

LINEAGIC POSITION

The genus *Nerine* Herb., is a member of the Tribe *Crineae* (see Traub, The Genera of Amaryllidaceae, 1963; and Traub, Introduction to Herbert's Amaryllidaceae, etc., 1967) to which belong also the genera *Ammocharis, Boophone, Crinum, Hessea, Strumaria, Brunsvigia* and *Cybistetes*. Species of *Crinum* have been crossed with those of *Brunsvigia* (= X *Crinodonna* Ragin. ex Stapf); and species of *Brunsvigia* have been crossed with those of *Nerine* (= X *Brunserine* Traub). It is evident that *Nerine* is most closely related to *Brunsvigia* and *Crinum* on the basis of crossing experiments carried on up to the present. However, crossing experiments with species of the other genera should also be attempted in order to determine the limits of genetic compatibility within the tribe. Morphologically, some *Nerine* species resemble those of *Hessea* in some particulars, but crossing experiments are needed to follow up this lead.

Due to the close relationship of *Nerine* to *Brunsvigia*, it is possible that at some future date, the two genera may have to be united on biological grounds. For the present, it is best to maintain *Nerine* as a separate genus.

ECONOMIC IMPORTANCE

At present the economic importance of *Nerine* resides entirely in the value of these species and hybrids (a) as outstanding ornamental garden and pot plant subjects; and (b) as the basis of cut flowers for the florist's trade.

In the future, the alkaloids found in the tissues of these plants may also be of some importance in medicine. The alkaloids reported in these plants as summarized by Hegnauer (1963) include brunsvigin (syn.-ambellin), caramin, crinin, crispin, falcatin, flexuosin, krigein, lycomin, neronin, tazettin, undulatin, and vittatin (see Hegnauer, R.: Chemotaxonomie der Pflanzen. 2: 59. 1963).

CARYOLOGY

The study of the chromosome numbers and chromosome morphology, the behavior of the chromosomes during meiosis, etc., (known as the science of caryology), has only begun in *Nerine*. A number of workers have reported mainly on chromosome numbers in 15 out of a total of presently recognized 30 species as shown in Table 2. It is hoped that studies on the remaining species can be undertaken also. The published results indicate that the basic number is x=11, with diploid numbers usually 2n=22, rarely 2n=24. In a number of cases triploids, 2n=33, have been reported.

Table 2. The genus **Nerine** Herb.: reported chromosome numbers of some species.

SECTION I. **LATICOMAE**, x=11

	2n number	Authority
marginata	22	Janaki Ammal (1951)*
laticoma (as **lucida**)	22	Janaki Ammal (1951)*
laticoma	22	Gouws (1949)**
duparquetiana	22	Gouws (1949)**

SECTION II. **NERINE**, x=11, 12

sarniensis	22, 24, 33	Janakai Ammal (1951)
sarniensis var. **corusca major**	22	James & Addicott (1941)=
sarniensis var. **rosea** (as **Nerine rosea**)	22	Muller (1912)==
sarniensis var. **moorei**	33	Janaki Ammal (1951)
sarniensis var. **curvifolia**	22, 24	Janaki Ammal (1951)
curvifolia f. **fothergillii major**	24	James & Addicott (1941)

SECTION III. **BOWDENIAE**, x=11, 12

bowdenii	22, 24	Janaki Ammal (1951)
flexuosa	22, 33	Janaki Ammal (1951)
flexuosa var. **alba**	22	James & Addicott (1941)
undulata	22, 33	Janaki Ammal (1951)
pudica	22, 33	Janaki Ammal (1951)
angustifolia	22	Janaki Ammal (1951)
filifolia	22, 24	Janaki Ammal (1951)
falcata	22	Gouws (1949)
humilis	22, 33	Janaki Ammal (1951)

SECTION IV. **APPENDICULATAE**, x=11, 12

appendiculata	22	Janaki Ammal	(1951)
masonorum	22	Janaki Ammal	(1951)
	24	Gouws	(1949)
frithii	22	Gouws	(1949)

* Janaki Ammal, E. K.: J. R. Hort. Soc. 76: 365. 1951
** Gouws, J. B.: Plant Life 5: 54. 1949
# James, W. M. & F. T. Addicott: Herbertia 8: 111-116. 1941
Muller, C.: Arch. Zellforsch. 8: 1—51. 1912.

In one hybrid, 'Inchmery Kate', the chromosome number is reported as tetraploid, 2n=44 (see Janaki Ammal, J. Roy. Hort. Soc. Oct. 1951). To date, tetraploids have not been revealed in nature, but when the remaining species are studied it may be possible to show that tetraploids may also occur among wild species.

LINORDINATION OF NERINE SPECIES

Herbert (1837) grouped the *Nerine* species known to him into (1) Regulares: perigone regular, filaments and style fasciculate, straighter; and (2) Irregulares: perigone distorted, filaments and style curved upwards, as shown in Table 1, above. Under these two classes he grouped the species under (a) umbel centripetal, and (b) umbel centrifugal. This is an artificial grouping and was not adopted by Baker (1888; 1896) who dispensed with subgroups as shown in Table 1, above.

In the present review, the species of *Nerine* are grouped under four sections. These are named and characterized briefly in the following key:

KEY TO THE SECTIONS OF **NERINE**

1a. Stamen-filaments thickened at the base, but not distinctly appendiculate, or otherwise modified at the base:
2a. Scape usually short, stout:

Section I. **LATICOMAE** Traub, **sect. nov.**

Filamentis staminorum basi non manifeste appendiculatis; scapo crasso brevi Nomenifer: **Nerine laticoma** (Ker-Gawl.) Th. Dur. & Schinz. Consp. Fl. Afr. 5. 1893.

2b. Scape usually longer, slender:
3a. Perigone, stamens and style nearly straight:

Section II. **NERINE**

Filamentis staminorum basi non manifeste appendiculatis; scapo longo gracili; perigonio staminibusque styloque paene erectis. Nomenifer: **Nerine sarniensis** (L.) Herb. Bot. Mag. sub pl. 2124. 1820.

3b. Perigone, stamens and style declinate:

Section III. **BOWDENIAE** Traub, **sect. nov.**

Filamentis staminorum basi non manifeste appendiculatis: scapo longo gracili; perigonio staminibusque styloque declinatns. Nomenifer: **Nerine bowdenii** W. Watson, Gard. Chron. vol. 36, p. 365.1904.

1b. Stamen-filaments distinctly appendiculate at the base, or alternating with scales, or forming a short staminal cup at the base:

Section IV. **APPENDICULATAE** Traub, **sect. nov.**

Filamentis staminorum basi distincte appendiculatis, vel squamis alternatis, vel basi cupulam staminalem constituentibus. Nomenifer: **Nerine appendiculata** Bak., in Gard. Chron. ii(1894)336.

According to the International Code of Nomenclature, the section which accomodates the nomenifer (name bearing element of the genus, Section II. *Nerine*) has to bear the same name as the genus and does not require an author.

KEY TO THE SPECIES OF **NERINE**

In the following key, 30 recognized species are grouped under the four sections of the genus as explained above. As already indicated, some of these may later be reduced to synonymy after further study. However, such changes have to be based upon solid evidence. Additional species may be discovered in the future. Prof. Ken Douglas, in a private communication, has indicated that he has discovered two new species which will be described later.

In the present review, the somewhat atypical species have been grouped under Section I. *Laticomae.*

(a) *Nerine marginata* apparently has inherited obvious *Brunsvigia* genes that determine the tongue-shaped leaf form, but the genes which are responsible for the flower form indicate an independent line of evolution since the flowers differ from those of *Brunsvigia* and the typical *Nerine.*

(b) The *laticoma-complex,* including five proposed species with synanthous bright green leaves and compressed scapes show slight variation. *N. laticoma* and *N. huttoniae,* with relatively shorter scapes, apparently inherited from a common ancestral stock shared with *Brunsvigia,* most closely resemble species in that genus. *N. flexuosa* var. *sandersonii* and *N. falcata,* with still longer scapes, and more delicate flowers, show still farther divergence from *Brunsvigia. N. krigei* with relatively long scapes only 5 mm. in diameter, comes even closer to the typical Nerines.

Finally, (c), *N. duparquetiana,* similar to the species of the *laticoma-complex* in some particulars, shows still another step in the direction of the typical Nerines in the minute pubescens on the scape and pedicels.

Apparently, the proper disposition of the five groups in the *laticoma-complex* is to consider those proposed later as subspecies under the name-bearer, *N. laticoma,* which happens to show the extreme variation in the direction of *Brunsvigia.*

The remaining typical *Nerine* species have been grouped under the three sections: Section II. *Nerine,* Section III. *Bowdeniae* and Section IV. *Appendiculatae* as already indicated.

KEY TO THE SECTIONS AND SPECIES

1a. Wild species:

2a. Stamen-filaments usually thickened below, but not distinctly appendiculate or otherwise modified, at the base, except for fleshy scales at the

base in **N. laticoma** subsp. **huttoniae**:
3a. Scape relatively short, stout, compressed:

Section I. **LATICOMAE** Traub

4a. Leaves tongue-shaped (lingulate), prostrate, hysteranthous; scape 15 cm. long, tepalsegs 3 cm. long, bright scarlet. R. S. Afr.: Cape Province ..... 1. **marginata**
4b. Leaves strap-shaped (lorate), synanthous, usually with a half twist in upper part; sometimes falcate:
5a. Scape and pedicel smooth; R. S. Afr.: Cape Province, Damaraland, Avamboland, Transvaal, Orange Free State ... 2. **Laticoma**
6a. Scape relatively shorter, 7.5—30 cm. long:
7a. Scape 7.5—20 cm. long, 9 mm. in diam.; umbel many-flowered; tepalsegs pale pink, or bright red, with deeper band in center ..... 2a. **laticoma** subsp. **laticoma**
7b. Scape 15—30 cm. long, 1 cm. in diam., umbel very many-flowered; tepalsegs pink with dark red or brown mid-vein; quadrate scales at the base of the tepalsegs. R. S. Afr.: Cape Province ..... 2b. **laticoma** subsp. **huttoniae**
6b. Scape relatively longer, 36—43 cm. long:
8a. Scape 1.2 cm. in diam.; leaves 2.7—3 cm. wide, umbel 20—25—flowered:
9a. Leaves not falcate; tepalsegs 4 mm. wide. R. S. Afr.: Transvaal ..... 2c. **laticoma** subsp. **sandersonii**
9b. Leaves leathery, falcate; flowers more dainty in shape and more delicate in color; tepalsegs 4.5 cm. long, 5 mm. wide, white, rose pink at the apex. R. S. Afr.: Transvaal ..... 2d. **laticoma** subsp. **falcata**
8b. Scape 5mm. in diam.; leaves narrower, 1.2 cm. wide; Tepalsegs rose-pink with green keel, R. S. Afr.: Transvaal ..... 2e. **laticoma** subsp. **krigei**
5b. Scape and pedicels covered with a minute pubescens; scape 7—8 mm. in diam.; umbel 15—20-flowered; tepalsegs white: flushed shell-pink at the face, and with a green keel. R. S. Afr.: Cape Province ..... 3. **duparquetiana**
3b. Scape relatively more slender
10a. Perigone, stamens and style nearly erect (see also **N. filamentosa** and **N. rehmannii** under Sect. III); leaves 1.2—2 cm. wide:

Section II. **NERINE**

11a. Tepalsegs hardly at all crisped:
12a. Leaves glabrous green, suberect; R. S. Afr.: Cape Province ..... 4. **sarniensis**
13a. Flowers bright crimson .... 4a. **sarniensis** var. **sarniensis**
13b. Flowers not **bright** crimson:
14a. Flowers duller crimson or bright scarlet:
15a. Flowers duller crimson .. 4b. **sarniensis** var. **plantii**
15b. Flowers bright scarlet:
16a. Flowers produced earlier than in other varieties ..... 4c. **Sarniensis** var. **venusta**
16b. Leaves broader than in type 4d. **sarniensis** var. **corusca**
14b. Flowers rose-colored or white:
17a. Flowers rose-colored .. 4e. **sarniensis** var. **rosea**
17b. Flowers white (Table Mountain) 4f. **sarniensis** var. **alba**
12b. Leaves glaucous, falcate. R. S. Afr.: Cape Prov. ..... 4g. **sarniensis** var. **curvifolia**
18a. Plant less robust ..... 4g-a. **sarniensis** var. **curvifolia** f. **curvifolia**

18b. Plant more robust in all its art ....4g-b. **sarniensis** var **curvifolia** f. **fothergillii**

11b. Tepalsegs distinctly crisped. R. S. Afr. habitat unknown .....4b. **sarniensis** var. **moorei**

10b. Perigone, stamens and style declinate; tepalsegs usually more or less crisped, except in **N. filamentosa** and **N. rehmannii:**

Section III. **BOWDENIAE** Traub

19a Leaves unknown; perigone white; umbel 3—5-flowered; stamens as long as the tepalsegs. R. S. Afr.: Natal ...5. **schlecteri**

19b. Leaves known:

20a. Leaves lanceolate, obtuse, umbel 1—5-flowered:

21a. Leaves prostrate, 8 mm. wide, hysteranthous, spathe-valves reddish purple; perigone rose-pink. R. S. Afr.: Cape Province .....6. **breachiae**

21b. Leaves not prostrate, synanthous. 1.3—2 cm. wide; spathe-valves pink; perigone pale pink. R. S. Afr.: locality unknown .....7. **rydleyi**

20b. Leaves linear-lorate, linear, subterete or filiform:

22a. Leaves linear, or linear-lorate; bright green or glaucous:

23a. Leaves linear-lorate, 1.5—3 cm. wide; bright green:

24a. Leaves hysteranthous, 1.5—3 cm. wide; tepalsegs rose-pink, deeper mid-rib, to 6—7.5 cm. long. R. S. Afr.: .....8. **bowdenii**

24b. Leaves synanthous, 1.5—2 cm. wide, tepalsegs pale pink, 2.5—3 cm. long. R. S. Afr.: Cape Province .....9. **flexuosa**

25a. Leaves bright green:

26a. Typical form .....9a. **flexuosa** var. **flexuosa**

26b. Flowers white .....9b. **flexuosa** var. **alba**

25b. Leaves glaucous; tepalsegs pink, pink with a rose-red keel .....9c. **flexuosa** var. **pulchella**

23b. Leaves linear, 3—13 mm. wide, synanthous, except hysteranthous in **N. alata** and **N. humilis** subsp. **fera:**

27a. Leaves bright green, except glaucous in **N. humilis** subsp. **fera.**

28a. Leaves 3—5 mm. wide:

29a. Umbel 6—12-flowered; perigone magenta-colored. R. S. Afr.: Cape Prov., Orange Free State, Natal, Transvaal. Botswana and Swaziland .....10. **angustifolia**

29b. Umbel 6—12-flowered; perigone mauve-pink. R. S. Afr.: Cape Prov. .....11. **Alata**

28b. Leaves 6.4—13 mm. wide:

30a. Tepalsegs 1.7—2 cm. long, pale pink. R. S. Afr.: Cape Prov., Orange Free State, and Damaraland ——————12. **undulata**

31a. Tepalsegs much crisped ..12a. **undulata** var. **undulata**

31b. Perigone larger and less crisped 12b. **undulata** var. **major**

30b. Tepalsegs 2.5—3 cm. long, bright pink or rose-red. R. S. Afr.: Cape Prov. .....13. **humilis**

32a. Leaves bright green, 1.3 cm. wide 13a. **humilis** subsp. **humilis**

32b. Leaves glaucous, 8 mm. wide R. S. Afr.: Cape Prov. .....13b. **humilis** subsp. **fera**

27b. Leaves glaucescent or glaucous, except bright green in **N. pudica** var. **elwesii:**

33a. Leaves glaucescent, 7—12 mm. wide; spathe 4.5 cm. long, dark reddish-purple; perigone carmine, pale above. R. S. Afr. Cape Prov. .....14. **peersii**
33b. Leaves glaucous, 6—8.5 mm. wide; spathe 2.5—3.8 cm. long. R. S. Afr.: locality unknown 15. **pudica**
34a. Perigone white with pink keel .15a. **pudica** var. **pudica**
34b. Perigone pale rose or white:
35a. Perigone pale rose, with deeper keel; leaves bright green .....15b. **pudica** var. **elwesii**
35b. Perigone pure white ..15c. **pudica** var. **alba**

22b. Leaves subterete or filiform:
36a. Leaves subterete:
37a. Umbel 6—20-flowered:
38a. Leaves 1.5 mm. in diam., umbel 10—20-flowered; perigone bright red, spathe 3.8—5 cm. long. R. S. Afr.: Cape Prov. .....16. **brachystemon**
38b. Leaves 2 mm. in diam., umbel 6—9-flowered; perigone bright rose; spathe nearly 7 cm. long. R. S. Afr.: Cape Prov. .....17. **filamentosa**
37b. Umbel 3—5-flowered; perigone white, rose in lower part; spathe 2 cm. long; leaves 2 mm. in diam. R. S. Afr.: Damaraland .....18. **pusilla**
36b. Leaves filiform, 1—2 mm. wide:
39a. Spathe ovate, acute or oblong, lanceolate, acute:
40a. Leaves 4—5, umbel 2—3-flowered; pedicels glabrous. R. S. Afr.: Cape Prov. .....19. **tulbaghensis**
40b. Leaves 1, rarely 2, umbel about 9-flowered; pedicels pubescent; R. S. Afr.: Transvaal ..20. **rehmannii**
39b. Spathe-valves lanceolate:
41a. Umbel 8—12-flowered; leaves synanthous; tepalsegs rose-pink. R. S. Afr.: Orange Free State ..21. **filifolia**
41b. Umbels 3—8 flowered; leaves hysteranthus; tepalsegs bright mauve-pink. R. S. Afr.: Cape Prov. _____22. **parviflora**

2b. Filaments variously appendiculate, or otherwise modified at the base; or filaments alternating with scales at the base; (see also **N. laticoma** subsp. **huttoniae** under Section I., above):

Section IV. **APPENDICULATAE** Traub

42a. Scape and/or pedicels **not** pubescent;
43a. Leaves 1—2 mm. wide:
44a. Umbels 5—7-flowered; leaves subfiliform:
45a. Filaments appendiculate at the base forming a staminal cup. R. S. Afr.: Cape Prov. and Orange Free State 23. **frithii**
45b. Filaments appendiculate at the base, forming a staminal cup, with lacerate lobes. R. S. Afr. .....24. **transvaalensis**
44b. Umbel 6—20-flowered; leaves linear; filament appendages almost free to the base, somewhat spreading. R. E. Afr.: Cape Prov. .....25. **hesseoides**
43b. Leaves terete, 1 mm. in diam.: tepalsegs wine red. 1.7 cm long. 2 mm. wide. Botswana .....26. **gaberonensis**
42b. Scape and/or pedicels **pubescent:**
45a. Perigone pure white; stamens alternating with square scales. R. S. Afr.: Natal .....27. **pancratioides**
45b. Perigone **not** pure white:
46a. Perigone pale to deep rose, deeper mid-vein; filament appendages conspicuous, white. R. S. Afr.: Natal .....28. **appendiculata**

Perigone rose-pink:
47a. Tepalsegs rose-pink, with darker central stripe; filament appendages lanceolate. R. S. Afr.: Cape Prov. .....29. **masonorum**

47b. Tepalsegs rose-pink, keeled green above the middle; filament appendages behind the base. R. S. Afr.: Transvaal
30. **gracilis**

1b. **Nerine** hybrids

Section I. **LATICOMAE** Traub

Scape relatively short, stout; stamen-filaments not distinctly appendiculate or otherwise modified, at the base, except for fleshy scales at the base in *N. laticoma* subsp. *huttoniae*. Nomenifer: *N. laticoma* (Ker-Gawl.) Th. Dur. & Schinz.

1. NERINE MARGINATA (Jacq.) Herb. Amaryll. 283. 1837; Bak. Amaryll. 102. 1888; Dyer, Plant Life 6: 67—69, pl. 7. 1950.

Syn.—*Amaryllis marginata* (Jacq.) Hort. Schoenbr. 1: 34, pl. 65. 1797; *Brunsvigia marginata* (Jacq.) Ait. Hort. Kew. ed. 2. 2: 230. 1810-1813; Ker-Gawl., Bot. Mag. sub pl. 1443. *Imhofia marginata* (Jacq.) Herb. App. 18. 1821; *Elisena marginata* (Jacq.) Roem. Syn. Monogr. Amaryll. 4: 63. 1847.

Bulb ovoid, 4—5—7.6 cm. in diam., tunics dark brown, membranous. *Leaves* 4, produced after the flowers, spreading on the ground, obovate-oblong or long lingulate, obtuse, 15—25 cm. long, 5—6.5—7 cm. wide, with a reddish crisped cartilagenous margin. *Scape* stout, compressed, 12—15—20 cm. long, 1 cm. in diam. *Spathe* 2-valved, deltoid, 2—3 cm. long, shorter than the pedicels. *Umbel* 12—20-flowered, centripetal; perigone more or less regular, erect, bright scarlet. *Pedicels* 3.8—5—7 cm. long. *Ovary* moderately 3-angled, turbinate, 1—1.5 cm. long, 6 mm. in diam. across the angles. *Tepaltube* very short, 5—7 mm. long. *Tepalsegs* lanceolate, 3 cm. long, 6.5 mm. wide, spreading, recurved, slightly undulate on the margins. *Stamens* suberect, nearly straight, a little longer than the tepalsegs; anthers oblong, 6—8 mm. long. *Style* straight, a little longer than the stamens. *Capsule* up to 2 cm. long, 1.5 cm. in diam.

Range.—R. S. Afr. Cape Province: Tulbagh, Wellington, Ceres Paarl.

Notes.—*Nerine marginata* has leaves similar to species of the subgenus *Brunsvigia*, genus *Brunsvigia*, and flowers unlike the typical flowers of either *Nerine* or *Brunsvigia*. It is apparently closely related to *Brunsvigia*.

2. NERINE LATICOMA (Ker-Gawl.) Th. Dur. & Schinz, Consp. Fl. Afr. 5 (1893); 256. (1895).

Syn.—*Amaryllis laticoma* Ker-Gawl., in Bot. Reg. 6: pl. 497. 1820-21; *Amaryllis lucida* Burchell, Travels 1: 536. 1822; D. Dietr. Syn. Pl. 2: 1181. 1839-52; *Nerine lucida* (Burch.) Herb., in Amaryll. 283, pl. 26. fig. 3. 1837; Bak. Amaryll. 102. 1888; Fl. Cap. 6(2): 214. 1896; Pole Evans, Fl. Pl. S. Afr. 4: pl. 134. 1924; *Imhofia lucida* (Burch.) Kuntze, Rev. Gen. 704. 1891; *Imhofia laticoma* (Ker-Gawl.) Schinz, in Bull. Herb. Boiss. 4: App. 3. p. 46.

Bulb globose, 4—(7.5—10) cm. in diam.; bulb-neck about 4 cm. long. *Leaves* 6—8, produced in summer and persisting at flowering time

in autumn, strap-shaped (linear), obtuse, bright green, 18—30—36 cm. long, 1.2—(1.8—2) cm. wide. *Scape* lateral, moderately stout, compressed, with rounded edges, 7.5—10—12—20 cm. long, 6x9 mm. in diam. *Spathe* valves ovate-lanceolate, membranous, 4 cm. long. *Umbel* 19—20—22(—40)-flowered, centripetal; perigone 3.8—4—4.2—(5) cm. long, pale pink, or bright red with narrow deeper-colored band in center of the tepalsegs. *Pedicels* 4.5—7.6—8—10 cm. long, stiff, moderately stout. *Ovary* obtusely-trigonous, 5—6.5 mm. long, 11 mm. in diam. *Tepaltube* 3 mm. long, 4 mm. in diam. (base), 5 mm. in diam. (apex). *Tepalsegs* lanceolate-linear, obtuse, 3.7—3.8 cm. long, 6—6.5 mm. wide, hardly at all crisped. *Stamens* declinate, nearly as long as the tepalsegs; filaments bright red; anthers oblong, 3—4 mm. long. *Style* bright red, declinate-ascending, as long as the stamens; stigma capitate. *Capsule* depresso-globose, 8—13 mm. in diam.

Range.—R. S. Afr.: Western portions of Cape Province; Damaraland and Avamboland; Transvaal, Orange Free State.

Notes.—*Nerine laticoma* resembles a dwarf *Brunsvigia* in general habit, but differs from that genus by the obtusely angled ovary and the less zygomorphic perigone. The relatively stout scape is also present in the three other subspecies of *Nerine laticoma*. The scape is relatively longer in plants grown under good garden culture.

The above description was checked against the existing ones, and includes the data from living cultivated plants, and the herbarium specimen No. 1055 (TRA), La Jolla, Calif. 7-18-63.

2b. NERINE LATICOMA subsp. HUTTONIAE Traub, COMB. NOV.

Syn.—*Nerine huttoniae* Schoenland, Rec. Alb. Mus. 1: 49. 1903 as *N. huttonii;* Dyer, in Fl. Pl. S. Afr. 29: pl. 1130. 1952.

Bulb ovoid, up to about 4 cm. in diam.; tunics membranous, pale brown. *Leaves* 7—10, produced with the flowers, subdistichous, lorate, 1—2 cm. wide, thin, and up to about 30 cm. long, shiny, finely ribbed, obtuse when young, but tip withers with age in its natural habitat; concave along the upper side; ascending in the lower half, recurved above. *Scape* green, arising from outside the leaves (lateral), 15—30 cm. long, 1 cm. in diam., flattened. *Spathe-valves* 2, dry, brown, ovate, cuspidate, about 3.5 cm. long. *Umbel* 20—75-flowered, may average nearly 40, pedicels arising from 3 extremely short growing points in the umbel; with the flowers from each growing point opening from the outside or base, giving the impression of a random opening of the flowers throughout the umbel. *Pedicels* angled, straight or slightly curved towards the flower, usually 8—12 cm. long. *Ovary* 3-angled. *Perigone* with very short tepaltube, 2.5—3.2 cm. long, the size probably depending somewhat on the number of flowers in the umbel; tepalsegs pink with dark red to brown mid-vein, oblanceolate-linear, spreading, recurved, slightly undulate. *Stamens*: filaments slightly shorter than the tepalsegs, red, with small lateral appendages at the base, and thickened dorsally; anthers reddish-brown, about 6 mm. long, turning black. *Style* red, about as long as the stamens. *Seeds* as large as peas, nearly globular.

Range.—Cape Province: Great Fish River Valley, near Craddock to Committees; near Sheldon.

Notes.—Named for Mrs. Hutton. Closely related to *N. laticoma*, but habitats are fairly widely separated.

2c. NERINE LATICOMA subsp. SANDERSONII (Bak.) Traub, COMB. NOV.

Syn.—*Nerine flexuosa* var. *sandersonii* Bak., Amaryll. 101. 1888; Fl. Cap. 6: 211. 1896; Pole Evans, in Fl. Pl. S. Afr. 4: pl. 139. 1924.

Bulb globose, 7 cm. in diam. *Leaves* about 7, usually twisted, 30 cm. long, 2.7 cm. wide, strap-shaped. *Scape* up to 40 cm. long, elliptic in cross-section (compressed with sharp edges). *Spathe-values* ovate, acuminate, 4 cm. long. *Umbel* about 25-flowered. *Pedicels* up to 7 cm. long, slender. *Ovary* globose, obscurely 3-angled. *Tepaltube* short. *Tepalsegs* crisped in the upper half, about 4 cm. long. *Stamens* declinate; filaments almost as long as the tepalsegs (when mature). *Stigma* simple.

Range.—R. S. Afr.: Transvaal.

2d. NERINE LATICOMA subsp. FALCATA (Barker) Traub, SUBSP. NOV.

Syn.—*Nerine falcata* Barker, in Fl. Pl. S. Afr. 13: pl. 511. 1933.

Bulb globose, 5—7 cm. in diam. *Leaves* 5—7, appearing with the flowers, falcate, erect or patent, with a half spiral twist, dark green, margins scabrous, 26 cm. long, 3 cm. wide, apex obtuse. *Scape* angular, 43 cm. long, 1.3 cm. in diam. *Spathe-valves* oblong, 4.8 cm. long, 1.8 cm. wide, membranous. *Umbel* 20—25 flowered, centripetal. *Pedicels* 9 cm. long, 2—3 mm. in diam. *Perigone* zygomorphic, the lower tepalsegs diverging widely from the stamens, 5—6 cm. in diam; tepalsegs *white*, patent, then recurved, linear acute, slightly undulate towards the apex and *rose-pink*, 4.5 cm. long, 5 mm. wide. *Stamens* declinate, filaments 3.2 cm. long, rose pink. *Ovary* obtusely angular, 4 mm. in diam.; style declinate, 4 cm. long.

Range.—R. S. Afr.: Transvaal, Ventersdorp.

Notes.—According to Barker (1933) *N. Falcata* appears to be most nearly related to *Nerine flexuosa* var. *sandersonii* (illustrated in Fl. Pl. S. Afr. pl. 129), both having a long slender angular scape, a centripetal umbel, non-appendiculate stamens, but the flowers of *N. falcata* "are more dainty in shape and more delicate in coloring" and this species also differs in having leathery falcate leaves, with scabrous margins, and obtuse apex; the falcate leaves most closely resemble those of *N. laticoma* (figured on Plate 124, Fl. Pl. S. Afr.,) but they are always raised well above the ground and not prostrate, as seems to be the rule in *N. laticoma*.

2e. NERINE LATICOMA subsp. KRIGEI (Barker) Traub, SUBSP NOV.

Syn.—*Nerine krigei* Barker, S. Afr. Gard. 22: 137. 1932; Fl. Pl. S. Afr. 15: pl. 567. 1935.

Bulb ovoid, 4 cm. in diam., continued into a neck, 2.5 cm. long, tunics papery, dark brown. *Leaves* 4—5, produced with the flowers (synanthous), erect, firm, spirally twisted, narrowing gradually to the obtuse apex, 27 cm. long. 1.2 cm. wide. *Scape* compressed and two-angled, spirally twisted, 36 cm. long, 5 mm. in diam. *Spathe-valves* 3.5 cm. long. *Umbel* 12-flowered, centripetal, up to 17 cm. in diam. *Pedicels*

glabrous, up to 7.5 cm. long. *Tepalsegs* 3.7 cm. long, 5 mm. wide, rose-pink with a green keel, slightly undulate, apex recurved. *Stamen-filaments* declinate, non-appendiculate at the base, almost as long as the tepalsegs. *Ovary* acutely angled, angles compressed and scabrous with minute papillae, 3 mm. long, 5 mm. in diam.; style short at first, finally as long as the stamens. *Stigma* minutely 3-lobed.

Range.—R. S. Afr.: Transvaal, Standerton, flowering in February and March. Incorrectly indicated as from Rhodesia, near Victoria Falls, in the original description.

Notes.—According to Barker (1935) this species belongs to the group of northern species comprising *N. laticoma*, *N. falcata* and the plant that is at present known as *N. flexuosa* var. *sandersonii* Bak. In common with these three, *N. krigei* has leaves that appear with the flowers (synanthous), the scape is compressed and two-edged, the umbel is many-flowered; the waving of the tepalsegs is obscure, and the stigma is inconspicuous. However, it differs from them all in having narrower leaves and acutely-angled and scabrous ovary; and agreeing with *N. falcata* in the general shape and size of the flowers, and acuminate tepalsegs.

3. Nerine duparquetiana (Baill.) Bak., Fl. Cap. *6*(2): 214. 1896; Dyer, Fl. Pl. S. Afr. pl. 1118. 1951.

Syn.—*Imhofia duparquetiana* Baill., in Bull. Linn. Soc. Paris ii(1894)1132; Bak. Gard. Chron. ii(1894)624.

Bulb globose, about 6 cm. in diam., bulb-neck present. *Leaves* 4—6, contemporary with the flowers, lorate, 20—26—30 cm. long, 1.5 cm. wide, straight or slightly arcuate, spreading on the ground with age, glabrous, green. *Scape* arising with, but outside the same season's leaves, compressed, about 18 cm. long, 7—8 mm. at its greatest width, and 4 mm. at its least; minutely pubescent with delicate short hairs. *Spathe-valves* 3.5—4 cm. long, lanceolate, scarious. *Umbel* 15—20-flowered, centripetal. *Pedicels* 6—9—10 cm. long, about 2.5 mm. in diam., pubescent with delicate short hairs. *Ovary* about 6 mm. in diam., somewhat obscurely 3-angled, ovules 2 per cell. *Tepaltube* very short. *Tepalsegs* linear-lanceolate, acuminate, not undulated, white within, flushed shell-pink at the face, and with a green keel down the back (with multinerved carmine keel according to Baillon), up to about 8 cm. long and 6 mm. wide; at first 5 tepalsegs spread upwards and reflex, and the 6th subtends the stamens and style, but gradually this rotates from the base, clockwise or counter-clockwise and the others move slightly in the same direction so that they are more or less symmetrically arranged, 3 on either side of the vertical axis. *Filaments* declinate, shorter than the tepalsegs; 3 slightly longer than the others; inserted on the apex of the short tepaltube, without basal appendages but occasionally showing rudimentary shoulders. *Style* at first straight, curving above the dehisced anthers as it matures; stigma capitate, pubescent (pappilose).

Range.—R. S. Afr.: Cape Prov., Kalahari Region.

Section II. NERINE

Scape relatively long, slender; stamens-filaments thickened at the base but not otherwise modified at the base; perigone, stamens and style nearly erect. Nomenifer: *N. sarniensis* (L.)Herb.

4. Nerine sarniensis (L.)Herb., Bot. Mag. sub pl. 2124. 1820; App. 19. 1821; Herb. Amaryll. 283. 1837; Gard. Chron. 779-810. 1885; Bak. Amaryll. 99. 188; Fl. Cap. 6(2): 209—210. 1896; Pole Evans, Fl. Pl. S. Afr. 9: pl. 355. 1929.

Syn.—*Amaryllis sarniensis* L., Sp. Pl. ed. 1. 293. 1753; Bot. Mag. 9: pl. 294. 1795; Red. Lil. pl. 33. 1802; Jacq. Hort. Schoenbr. 1: 34, pl. 66. 1797; *Amaryllis dubia* Houtt., Handeiding. . . . Pl. 11: 181. pl. 84. cum. ic. 1773-83; *Haemanthus sarniensis* (L.) Thunb. 58. 1794-1800; Fl. Cap. ed. Schult. 298. 1823; *Amaryllis jacquinii* Tratt., Gartenfl. 43. 1821; *Nerine cochinchinensis* M. Roem. Syn. Monogr. Amaryll. 4: 104. 1847; *Nerine jacquinii* (Tratt.) M. Roem. Syn. Monogr. Amaryll. 4: 105. 1847; *Nerine insignis* Leichtl. Gard. Chron. i(1886)41; *Nerine profusa* Bak., Amaryll. 1888; *Nerine sarniensis* var. *profusa* Bak. Amaryll. 100. 1888.

Bulb globose, 2.5—3 cm. in diam. *Leaves* about 6, appearing after the flowers, 15—30 cm. long, 1.2—1.9 cm. wide, strap-shaped, obtuse, glabrous, bright green, suberect. *Scape* 25—30—46 cm. long, compressed, smooth. *Spathe-valves* 2, crimson, ovate-lanceolate, 3.8—5 cm. long. *Umbel* 7—10—20-flowered, centripetal; perigone erect, 3.8 cm. long. *Pedicels* 1—3(—5) cm. long, of different lengths in the same umbel; terete, glabrous. *Ovary* globose, 2—3—4 mm. in diam. *Tepaltube* very short (3 mm. long?). *Tepalsegs* 3.5 cm. long, 6—13 mm. wide, at length reflexed, oblanceolate, crisped on the margin. *Stamens* erect; filaments scarlet, slightly (1.3 mm.) longer than the tepalsegs; anthers 3—4 mm. long, versatile. *Style* straight, nearly 5 mm. long.

Range.—R. S. Afr. Coast Region, Table Mountain.

Notes.—Known under the common name, "Guernsey Lily". Flowers in September and October in Northern Hemisphere.

4a. Nerine sarniensis var. sarniensis. Flowers bright crimson.

4b. Nerine sarniensis var. plantii Bak. Amaryll. 100. 1888. Flower scapes taller than in the other varieties; flowers duller crimson, or rosy-crimson; scape longer; tepalsegs distinctly unguiculate. *Nerine plantii* O'Brien, Flora & Sylva 3: 122. 1805, nomen subnudum, apparently belongs here.

4c. Nerine sarniensis var. venusta (Ker-Gawl.) Bak., Amaryll. 100. 1888.

Syn.—*Amaryllis venusta* Ker-Gawl. Bot. Mag. pl. 1090. 1808; *Nerine venusta* (Ker-Gawl.) Herb. App. 19. 1821; Bot. Mag. 2124. 1820; Herb. Amaryll. 283. 1837; *Nerine venusta* var. *sarniensis* (L.) Herb. in Amaryll. 283. 1837; *Nerine venusta* var. *minor* Herb. Amaryll. 283. 1837; *Imhofia venusta* (Ker-Gawl.) Salisb. Gen. Pl. 118. 1866.

Flowers bright scarlet, produced in September; tepalsegs wavy, quite falcate.

4d. Nerine sarniensis var. corusca (Ker-Gawl.) Bak., Amaryll.

100. 1888; Fl. Cap. 6(2) : 210. 1896.

Syn.—*Amaryllis corusca* Ker-Gawl., Bot. Mag. sub pl. 1430. 1811; *Amaryllis humilis* β Ker-Gawl., Bot. Mag. pl. 1089. 1808; *Nerine corusca* (Ker-Gawl.) Herb. Bot. Mag. sub pl. 2124. 1820; Herb. App. 1821; Amaryll. 283. 1837; *Imhofia corusca* (Ker-Gawl.) Salisb. Gen. Pl. 118. 1866.

Leaves broader than in the typical form, bright green, with distinct cross-bars between the main veins; flowers large, bright scarlet, resembling those of *N. sarniensis* var. *curvifolia*.

4e. NERINE SARNIENSIS var. ROSEA (Herb.) Bak., Amaryll. 100. 1888; Fl. Cap. 6(2) : 210. 1896.

Syn.—NERINE ROSEA Herb. App. 19. 1821; Bot. Mag. pl. 2124. 1820; *Nerine venusta* var. *rosea* (Herb.) Herb. Amaryll. 283. 1837; *Imhofia rosea* (Herb.). Salisb. Gen. Pl. 118. 1866.

4f. NERINE SARNIENSIS var. ALBA Traub, *var. nov. floribus albis.*

Flowers pure white. Range.—Table Mountain.

4g. NERINE SARNIENSIS var. CURVIFOLIA (Jacq.) Traub, VAR. NOV.

Syn.—*Amaryllis curvifolia* Jacq., Hort. Schoenbr. 1: 33, pl. 64. 1797; Ker-Gawl., Bot. Mag. pl. 725. 1804; Red. Lil. pl. 274. 1809; *Nerine curvifolia* (Jacq.) Herb. App. 19, 1821; Bot. Mag. pl. 729; Amaryll. 283. 1837; Bak. Amaryll. 100. 1888; Fl. Cap. 6(2) : 210. 1896. *Imhofia glauca*, Gen. Pl. 118. 1866.

Bulb ovoid, 3.8—5 cm. in diam., tunics pale brown. *Leaves* 6, developed after the flowers, lorate, obtuse, curved laterally, thicker in texture than in *N. sarniensis*, glaucous, closely veined, up to 30 cm. long, 1.3—1.9 cm. wide. *Scape* slender, glaucous, 30—47 cm. long. *Spathevalves* about as long as the pedicels. *Umbel* 8—12-flowered, centripetal, perigone erect, bright scarlet, 3—3.8 cm. long. *Pedicels* 2.5—3.8 cm. long. *Ovary* globose, 4 mm. in diam. *Tepaltube* very short. *Tepalsegs* oblanceolate, 6.5 mm. wide, equally falcate, but little crisped. *Stamens* suberect, about as long as the perigone. *Style* suberect, finally 5 cm. long.

Range.—R. S. Afr.: habitat unknown.

Notes.—Common in gardens in Europe and the United States, where it flowers in the middle to the end of September. This species is retained tentatively until a more critical study can be made.

4g.-a. NERINE SARNIENSIS var. CURVIFOLIA f. CURVIFOLIA. Plant less robust.

4g.-b. NERINE SARNIENSIS var. CURVIFOLIA f. FOTHERGILLII (Andr.) Traub, f. nov.

Syn.—*Amaryllis fothergillii* Andr. Bot. Reposit. 163. 1816; *Nerine fothergillii* (Andr.) Roem. Monogr. Amaryll. 104. 1847; *Nerine curvifolia* var. *fothergillii* (Andr.) Bak. Fl. Cap. 6 : 210. 1896; *Nerine fothergillii* var. *major* Fitzherbert, Gard. Chron. ii(1904)332.

Plant more robust in all its parts; leaves broader; flowers in the umbel numerous, colored between crimson and scarlet.

4h. NERINE SARNIENSIS var. MOOREI (Leicht.) Traub, VAR. NOV.

Syn.—*Nerine moorei* Leichtl. in Gard. Chron. ii(1886)681; Bak., Amaryll. 100. 1888; Fl. Cap. 6(2) : 210-211. 1896.

Bulb globose. *Leaves* produced a little after the flowers, 22—30 cm. long, 1.3—1.9 cm. wide, much curved, slightly twisted, bluntly acute, bright green. *Scape* stout, compressed, shorter than the leaves. *Spathe-valves* lanceolate, longer than the pedicels. *Umbel* 6—9-flowered, centripetal; perigone bright scarlet, erect. Pedicels 2—2.5 cm. long; *Ovary* 3.5 mm. in diam. Tepelsegs oblanceolate, crisped, 3 cm. long, nearly 6.5 mm. wide. *Stamens*: filaments erect, longer than the tepalsegs; anthers oblong. *Style* straight, 3.8 cm. long.

Range.—R. S. Afr.: Habitat unknown. Described from a plant sent to Leichtlin by F. W. Moore, of the Glasnevin Gardens. This may be a hybrid between *N. curvifolia* and *flexuosa,* and is retained here *tentatively* until a more critical study can be made.

Section III. **BOWDENIAE** Traub

Scape relatively longer, slender; stamen-filaments thickened at the base, but not otherwise modified at the base; perigone, stamens and style declinate. Nomenifer: *Nerine bowdenii* W. Watson.

5. NERINE SCHLECTERI Baker, in Bull. Herb. Boiss. 2nd ser. 3: 665. 1903; Plant Life: 9: 76. 1953.

Bulb and leaves unknown, but the latter apparently appearing after the flowers. *Scape* slender, 30 cm. or more long. *Spathe-valves* 2, lanceolate, scarious, 1.2—1.8 cm. long. *Umbel* 3—5-flowered; perigone white, 1.2—1.4 cm. long. *Pedicels* 6—8 mm. long, densely pubescent. *Ovary* depresso-globose, 4 mm. in diam., densely pubescent. *Tepaltube* very short. *Tepalsegs* flat, equal, lanceolate, (1—1.2 cm. long), 4 mm. wide. *Stamens* declinate, equaling the tepalsegs; filaments filiform, without appendages; anthers small, oblong, brown.

Range.—R. S. Afr.: Natal; among rocks on Mt. West, alt. 1800 m.

Notes.—Living material of this species is needed for further study.

6. NERINE BREACHIAE Barker, in Fl. Pl. S. Afr. 15: pl. 566. 1935.

Bulb small, oblong-globose, 1.5 cm. in diam., continued into a short neck. *Leaves* 2—4, appearing after the flowers (hysteranthous), adpressed to the ground, lanceolate, subobtuse, dark green, 5 cm. long, 8 mm. wide. *Scape* terete, glabrous, 26 cm. long, 2.5 mm. in diam. *Spathe-valves* membranous, reddish-purple, 2—3 cm. long. *Umbel* usually 1—5-flowered, rarely up to 8-flowered. *Pedicels* glabrous, 2.5—4.5 cm. long. *Ovary* obtusely angled, 2.5 mm. in diam. *Tepalsegs* rose-pink, linear, apex recurved and undulate, 3.4 cm. long, 4—5 mm. wide. *Stamen-filaments* non-appendiculate at the base, shorter than the perigone, 2.5 cm. long. *Style* conspicuously longer than the stamens throughout the flowering period; stigma when mature distinctly 3-lobed.

Range.—R. S. Afr.: Cape Province, Bredasdorp Division, Bredasdorp.

Notes.—According to Barker(1935), *N. breachiae* flowers in late autumn: the leaves beginning to show as the flowers wither, and when mature are pressed to the surface of the ground, which distinguishes it from all others in this section, and which is shared only by the otherwise different *N. marginata.* It is among the lowliest of the genus; its nearest

ally being *N. humilis*, but this has longer, glaucous, and almost erect leaves.

7. Nerine rydleyi E. P. Phillips, in Ann. S. Afr. Mus. 9: 128. 1913.

Bulb globose, 3—4 cm. long, 3—4 cm. in diam., continued into a neck about 4 cm. long; tunics membranous, brown. *Leaves* 4—5, contemporary with the flowers, 7—9 cm. long, 1.3—2 cm. wide in the widest part, lanceolate, obtuse, narrowed at the base, pustulate above, glabrous, dark green above, lighter on under side. *Scape* about 23 cm. long, 3 mm. in diam., terete, glabrous, purplish below, becoming green above. *Spathe-valves* linear-oblong, acuminate, acute, pink, 3 cm. long. *Umbel* 5-flowered, flowers declined. *Pedicels* 3—4 cm. long, 1.5 mm. in diam., subtrigonous. *Ovary* 3 mm. long, globose, brown. *Tepalsegs* about 3 cm. long, 5 mm. wide, the two anterior ones much wider apart than the others, linear, subobtuse, recurved, crisped, with a small glandular papilla at the apex, pale pink, with a prominent midrib beneath (keel) of usually slightly deeper pink, and a distinct red streak on the lower half of the inner face of the tepalsegs. *Stamens* unequal in length, about horizontal, recurved upwards at the ends; 3 shorter filaments 2 cm. long; 3 longer 2.5 cm. long; all terete, pale pink, anthers 6 mm. long, oblong, purplish. *Style* horizontal, recurved above, 3.3 cm. long, terete, pale pink, stigma when mature trifid and papillose at the apex.

Range.—R. S. Afr.: locality unknown. Described from cultivated plant in the Municipal Gardens, Cape Town, May 1913.

Notes.—Considered as near *N. flexuosa*, but differing in the much shorter and comparatively broader leaves, and in the fewer-flowered umbel. Named in honor of G. H. Ridley, Curator at the Municipal Gardens, Cape Town.

8. Nerine bowdeni W. Watson, Gard. Chron. 1904, vol. 36, p. 365; Bot. Mag. pl. 8117. 1907; Dyer, Fl. Pl. S. Afr. 22: pl. 841. 1942.

Syn.—*Nerine veitchii* Gard. Chron. ii(1911)244, nomen subnudum.

Bulb 5 cm. in diam, 6 cm. long, continued into a bulb neck 6 cm. long. *Leaves* produced after the flowers, up to 8—20—30 cm. long, 1.5—3 cm. wide. *Scape* erect, up to 45 cm. long, nearly cylindric, 5—6 mm. in diam., solid at the base, becoming hollow towards the apex. *Spathe-valves* 2, membranous, lanceolate, unequal in length, up to 5 cm. long. *Umbel* 6—7-flowered (sometimes up to 12-flowered in cultivation), 15—20 cm. across. *Pedicels* trigonous, up to about 5 cm. long, the central ones shorter. *Tepaltube* very short. *Tepalsegs* rose-pink, the midrib darker; up to 6 (—6.4—7.6) cm. long, 7—8 mm. wide, undulate along the margins, above the middle on the recurved portions. *Stamens* without appendages, somewhat shorter than the tepalsegs; upcurved at the tips. *Style* about as long as the stamens, very shortly 3-lobed, the lobes adhering together (obscurely 3-lobed). *Capsule* obtusely and irregularly 3-lobed, up to 1 cm. in diam.

Range.—R. S. Afr.: Cape Province.

Notes.—Named for Mr. Athelstan Cronish-Bowden, who sent the bulbs from Cape Province to his mother in England. Gumbleton described it as *N. excellens tardiflora* (Gard. Chron. Feb. 13, 1904, p. 105),

and Veitch exhibited it as *N. excellens* major *tardiflora* (Gard. Chron. Oct. 22, 1904, p. 292).

9. NERINE FLEXUOSA (Jacq.) Herb. App. 19. 1821; Amaryll. 283. 1837; Kunth, Enum. Pl. 5: 619. 1850; Bak., Amaryll. 100. 1888; Fl. Cap. 6(2): 211. 1896; Barker, Fl. Pl. S. Afr. 15: pl. 561. 1935.

Syn.—*Amaryllis flexuosa* Jacq., Hort. Schoenbr. 1: 35, pl. 67. 1797; Ker-Gawl. Bot. Reg. pl. 172.

Bulb subglobose, 2.5—3.8 cm. in diam., continued into a neck; tunics light brown. *Leaves* 4—6, contemporary with the flowers, linear-lorate, arcuate, bright green, smooth, thin, up to 60 cm. long, 1.5—2 cm. wide. *Scape* slender, subterete, glabrous, flexuose, up to 60 cm. long, 4 mm. in diam. *Spathe-valves* lanceolate, tinged with reddish-purple, 3.8 cm. long. *Umbel* 6—10—20-flowered, centripetal; perigone generally pale pink. *Pedicels* 2.5—3.8—5—7.5 cm. long, slender. *Ovary* globose-trigonous, 4 mm. in diam. *Tepaltube* very short. *Tepalsegs* crisped, oblanceolate, 2.5—3 cm. long, 4 mm. wide. *Stamens* declinate, the 3 longer ones shorter than the tepalsegs, anthers oblong, claret red, 3—4 mm. long. *Style* pale pink, declinate, as long as the stamens.

Range.—R. S. Afr.: Cape Province Central Region; Kalahari Region.

9a. NERINE FLEXUOSA var. FLEXUOSA. The typical form.

9b. NERINE FLEXUOSA var. ALBA Gumbleton, Gard. Chron. ii(1904) 334. Flowers white.

9c. NERINE FLEXUOSA var. PULCHELLA (Herb.) Bak., Amaryll. 101. 1888; Fl. Cap. 6(2): 211. 1896. Syn—*Nerine pulchella* Herb. App. 19. 1821; Bot. Mag. pl. 2407.

Leaves glaucous, firmer in texture than in the type. *Scape* not flexuose. *Tepalsegs*, pink with a rose-red keel. Stamens and style nearly white.

10. NERINE ANGUSTIFOLIA (Bak.) W. Watson, in Gard. Chron. ser. 3. 6. 1889; Bak. Fl. Cap. 6: 209, 211. 1896; Pole Evans, in Fl. Pl. S. Afr. 17: pl. 658. 1937; R. H. S., Dict. Gard. 3: 1367. 1951; Sealy, Bot. Mag. 70: pl. 244. 1955.

Syn.—*Nerine pulchella* var. *angustifolia* Bak., Saund. Ref. Bot. 5: pl. 329. 1872; *Nerine flexuosa* var. *angustifolia* (Bak.) Bak., in Gard. Chron. n. ser. 24, 779, 1885; et Amaryll. 101. 1888; *Nerine angulata* L. Bolus, in S. Afr. Gard. 20: 148. fig. B. 1930.

THE ELEGANT NERINE. *Bulb* ovate, 2.5 (—3.8) cm. long, 1.7 cm. in diam.; tunics gray-brown. *Leaves* 6, contemporary with the flowers, linear, slightly narrowed in the upper part to the blunt apex, about 33 cm. long, 3—5 mm. wide, bright green, suberect. *Scape* terete, 40—70 cm. long above the ground, bright green, sparsely spreading puberulous, more densely so at the apex. *Spathe-valves* lanceolate, 2.5 cm. long, white, membranous and ribbed at anthesis; bracteoles filiform, 1—1.7 cm. long, white. *Umbel* 6—12-flowered. *Pedicels* 1.3—5(—7) cm. long, densely covered with short spreading somewhat glandular rather thick papilla-like hairs which become brownish in dried specimens. *Ovary* subglobose, 3-locular, about 5 mm. in diam., densely covered with short spreading

hairs like those of the pedicels. *Tepaltube* about 2—3 mm. long. *Tepalsegs* linear-oblong, obtuse, 3—3.3—4—4.3 cm. long, 5 mm. wide; the anterior tepalseg extended horizontally and the other five tepalsegs spreading-ascending, and somewhat recurved, magenta-colored, deeper along the middle of the tepalsegs, 3-nerved in the middle, margins somewhat undulate. *Stamens* adnate to the inside of the tepaltube for about 2—3 mm.; filaments declinate, upcurved toward the apex, free part 2—2.5 cm. long, filiform from a broad base, magenta-colored; anthers dull purplish, 5—5.5 mm. long at first, blackish; about 2.5 mm. long when dehisced; pollen pale creamy yellow. *Style* about 2 cm. long, straight or decurved at first, magenta-colored; stigma 3-lobed, white papillose.

Range.—Southern Africa: R. S. Afr.: n. Cape Province, Orange Free State, n. Natal, and Transvaal. Botswana and Swaziland.

Notes.—According to Sealy (1955), *N. angulata* L. Bolus is conspecific with *N. angustifolia*. He further believes that *N. angustifolia* should be combined with *N. filifolia* as a variety, but the writer does not share this opinion. He states that *N. filamentosa* W. N. Barker can scarcely rank as more than a variety of *N. filifolia*, but again, the writer does not share this opinion.

11. Nerine alata Barker, in Fl. Pl. S. Afr. 15: pl. 563. 1935.

Bulb globose, up to 4 cm. in diam. *Leaves* appearing after the flowers (hysteranthous), linear, obtuse, green, 10 cm. or more long, 9 mm. wide. *Scape* terete, bright green, glabrous, very tall, 60—90 cm. long, 5 mm. in diam. *Umbel* 14—18-flowered, centrifugal, 7—9 cm. in diam. *Spathe-valves* acute, dark reddish-purple, 2.5 cm. long or a little longer, 5 mm. wide. *Pedicels* green, tinged with brown, up to 2.5 cm. long. *Tepalsegs* mauve-link, margins much crisped throughout their whole length, 2.1 cm. long, 2.5 mm. wide, conduplicate in the lower half, widening and flattening, thus forming as it were a cup above the ovary, 5 mm. long, 5 mm. in diam. *Stamens* declinate, finally 1.6 cm. long; anthers dark red before dehiscing, 4 mm. long. *Ovary* obtusely-angled, 2.5 mm. in diam.; style slender, finally as long as the stamens; stigma minute, 3-lobed.

Range.—R. S. Afr.: Cape Province, King William Division, Hogsbeck.

Notes.—*Nerine alata* is closely allied to *N. undulata* but differs from it mainly in the hysteranthous leaves, the very long scape, tepalsegs "distinctly longer than the stamens, and conspicuously widened at the base, with the dilated parts either contiguous or slightly overlapping, so that a sort of cup is formed above the ovary." The type locality (Hogsbeck) has produced no other *Nerine*, and it is unlikely that its range would overlap with that of *N. undulata*.

This species was first collected by Frances Leighton, March 1932.

12. Nerine undulata (L.) Herb. App. 19. 1821; Amaryll. 283, Pl. 45, fig. 2. 1837; Bak., Amaryll. 102. 1888; Fl. Cap. 6(2): 212—213. 1896.

Syn.—*Amarullis undulata* L., in Syst. Nat. ed. 12: Mill. Hort. Kew, 352, cum ic.; L'Herit. Sert. Angl. 16; Bot. Mag. pl. 369. 1797; Red. Lil.

115. 1805; Jacq. Hort. Bot. Vind. etc. 3: pl. 13. 1776; Tratt. Arch. pl. 393. 1814; *Haemanthus undulatus* (L.)Thunb., Fl. Cap. ed. Schult. 297. 1823; *Nerine crispa* Bak., Amaryll. 102. 1888; Vilmorin in Blumeng. ed. 3. Sieb & Voss. 1: 1008. 1895.

Bulb ovoid, 2—2.5 cm. in diam., tunics pale, membranous. *Leaves* 4—6, linear, contemporary with the flowers, bright green, 6.4—1.3 mm. wide. *Scape* slender, 30—46 cm. long, 6—13 mm. wide. *Spathe-valves* lanceolate, as long as the pedicels. *Umbel* 8—12-flowered, centrifugal; perigone pale pink (rose). *Pedicels* slender, 2.5—3.8 cm. long. *Ovary* globose-trigonous, 3—4 mm. in diam. *Tepaltube* very short. *Tepalsegs* spreading widely from the base, oblanceolate, much crisped, 1.7—2 cm. long, 2 mm. wide. *Stamens* declinate, about as long as the tepalsegs. *Style* declinate, as long as the petalsegs. *Capsule* deeply lobed, 6 mm. in diam.; 1 seed per locule.

Range.—R. S. Afr.: Coast Region below Table Mountain; Wynberg to Port Elizabeth; Kalahari Region; and Orange Free State; and lower Damaraland.

12a. NERINE UNDULATA var. UNDULATA. The typical form. Tepalsegs much crisped.

12b. NERINE UNDULATA var. MAJOR (Tratt.)Bak. Amaryll. 102. 1888; Fl. Cap. 6(2): 213. 1896. Syn.—*Amaryllis major* Tratt. Arch. pl. 394; *Amaryllis aucta* Tratt. Thes. Bot 9, pl. 45. 1819; *Nerine aucta* (Tratt.) M. Roem. Syn. Monogor. Amaryll. 4: 107. 1847.

Perigone larger and less crisped. Appears to be nothing more than a form.

13. NERINE HUMILIS (Jacq.) Herb. Bot. Mag. sub pl. 2124. 1820; App. 19. 1821; Amaryll. 283. 1837; Kunth. Enum. Pl. 5: 621. 1850; Leichtl. Bull. Soc. Tosc. Ortic. 15: pl. 5, fig. 2. 1890; Bak. Amaryll. 102. 1888; Fl. Cap. 6(2): 213. 1896;

Syn.—*Amaryllis humilis* Jacq. Hort. Schoenbr. 1: 36, pl. 69, 1797; Red. Lil. pl. 450. 1816; Bot. Mag. pl. 726. 1804.

Bulb ovoid, 2.5—3.8 cm. in diam., tunics membranous. *Leaves* about 6, contemporary with the flowers in November (Northern Hemisphere), linear, bright green, suberect, channeled down the face, about 20 cm. long, about 1.3 cm. wide. *Scape* slender, subterete, slightly glaucous, 15—46 cm. long. *Spathe-valves* lanceolate, green, about as long as the pedicels. *Umbel* 10—20-flowered, centrifugal; perigone bright pink or rose-red, 2.5—3 cm. long. *Pedicels* slender, 2.5—3.8 cm. long. *Ovary* globose-trigonous, 3—4 mm. in diam. *Tepaltube* very short. *Tepalsegs* oblanceolate, acute, crisped, 2.5—3 cm. long. *Stamens* declinate, the 3 longer about equaling the tepalsegs; anthers oblong, purple, 3 mm. long. *Style* declinate, as long as the tepalsegs.

Range.—R. S. Afr.: Cape Province, Coast Region, Table Mountain; Albany Division.

Notes.—Differs from *N. flexuosa* by the centrifugal umbel, its dwarfer habit, and narrower, channeled leaves.

13a. NERINE HUMILIS subsp. HUMILIS. Leaves bright green, umbel 10—20-flowered.

13b. NERINE HUMILIS subsp. FERA (Barker)Traub, *comb. nov.*

Syn.—*Nerine humilis* forma *fera* Barker, in Fl. Pl. S. Afr. 15: pl. 564. 1935.

Bulb oblong, 4.5 cm. long, 2.5 cm. in diam.; continued into a neck 3.5 cm. long, tunics grayish. *Leaves* 3—5, appearing after the flowers (hysteranthous), suberect or spreading, linear, obtuse, glaucous green, 16 cm. long, 8 mm. wide. *Scape* terete, glabrous, bright green, up to 31 cm. long, 3 mm. wide. *Spathe-valves* lanceolate, acute, purplish-red, up to 4 cm. long. *Umbel* centrifugal, 6—7-flowered. *Pedicels* glabrous, up to 4.3 cm. long. *Ovary* obtusely-angled, 3 mm. in diam. *Tepalsegs* pink with a red central stripe, only slightly undulate, recurved near the apex, 3.1 cm. long, 4 mm. wide. *Stamens* declinate, nearly as long as the perigone. *Style* declinate, longer than the stamens; stigma minutely 3-lobed.

Range.—R. S. Afr.: Cape Province; Collected by Prof. T. Baron and Paymaster Captain Salter in April 1932.

Notes.—*Nerine humilis* subsp. *fera* differs from the typical form mainly in the glaucous, hysteranthous leaves, fewer-flowered umbel.

14. Nerine peersii Barker, Fl. Pl. S. Afr. 15: pl. 562. 1935.

Bulb depresso-globose, 2.5 cm. long, 3 cm. in diam., continued into a neck above, up to 7 cm. long. *Leaves* 5, appearing with the flowers, linear, obtuse, minutely scabrous on the upper surface, scarcely glaucous, up to 25 cm. long, 7—12 mm. wide. *Scape* terete, bright green, reddening at the base, 32 cm. long, up to 3 mm. in diam. *Spathe-valves* lanceolate, dark reddish-purple, 4.5 cm. long. *Umbel* 5—6-flowered, centrifugal, 15 cm. in diam. *Pedicels* quite glabrous, 4—6 cm. long. *Ovary* obtusely angled, 3 mm. in diam., several ovules in each locule. *Tepalsegs* finally all forming the posticus lip (the stamens and style forming the anticus lip), linear, acuminate, undulate in the upper half, the apex recurved and spirally twisted; the margins in the lower half incurved, and minutely crisped, the base flat and deep carmine, paler above, with a narrow strip near the base on the upper side, 4—5 cm. long, up to 4 mm. wide. *Stamens* as long as the tepalsegs; anthers dark red before dehiscing, 6 mm. long. *Style* throughout the flowering period longer than the stamens; stigma conspicuously 3-lobed when mature.

Range.—R. S. Afr.: Cape Province, Uniondale Division.

Notes.—*Nerine peersii* resembles *N. flexuosa* var. *pulchella* (see Bot. Mag. pl. 2407), but differs in having long-acuminate, narrower tepalsegs, which are more markedly waved at the margins, a more slender scape, somewhat flexuous pedicels; leaves scarcely glaucous, and more numerous, and in other particulars.

The species was named for V. S. Peers.

15. Nerine pudica Hook. f. Bot. Mag. pl. 5901. 1871; Bak. Amaryll. 101. 1888; Fl. Cap. 6(2): 212. 1896; Fl. des Serres, pl. 2464. 1880; Leichtl. Bull. Soc. Tosc. Ortic. 15: pl. 5, fig. 3. 1890.

Bulb globose, about 2.5 cm. in diam. *Leaves* 4—6, contemporary with the flowers, linear, glaucous, suberect, persistent, 20—23 cm. long, 6—8.5 mm. wide. *Scape* slender, subterete, 30—46 cm. long. *Spathe-valves* lanceolate, 2.5—3.8 cm. long. *Umbel* 4—6-flowered, centripetal; perigone erect or deflexed, 3—3.8 cm. long. *Pedicels* slender, 2.5—3.8 cm. long.

Ovary globose, 4 mm. in diam. *Tepaltube* very short (5 mm. long?). *Tepalsegs* oblanceolate, thin, plane, scarcely at all crisped, white with a pink keel, 2.5—3.2 cm. long. *Stamens* declinate, the 3 longer a little shorter than the tepalsegs; anthers oblong, 3 mm. long. *Style* declinate, as long as the tepalsegs. Seeds globose.

Range.—R. S. Afr.: locality unknown. First described from a plant that flowered at Kew in 1868.

Notes.—Flowers in September (northern hemisphere).

15a. Nerine pudica var. pudica. Tepals white with a pink keel.

15b. Nerine pudica var. elwesii Leichtl. ex. Bak., Amaryll. 101. 1888; Fl. Cap. 6(2): 212. 1896. Syn.—*Nerine elwesii* Leichtl., Gard. Chron. i(1886)42, nom. nud.

Leaves much broader, bright green, more persistent, distinctly veined, with a prominent mid-rib; umbel more compact, pedicels shorter, tepalsegs pale rose with a darker keel, thicker and more wavy.

15c. Nerine pudica var. alba Worsley, Gard. Chron. ii(1911)325. Flowers pure white.

16. Nerine brachystemon Bak., Fl. Cap. 6(2): 212. 1896.

Bulb unknown. *Leaves* about 5, subterete, glabrous, 30 cm. long, 1.5 mm. in diam. *Scape* slender, 46 cm. long. *Spathe-valves* 3.8—5 cm. long. *Umbel* 10—20-flowered, centripetal; perigone bright red. *Pedicels* stiffly erect, pubescent, 3.8—5 cm. long. *Ovary* globose, deeply lobed, 4.2 mm. in diam. *Tepaltube* very short. *Tepalsegs* linear, rather crisped, 2—2.2 cm. long. *Stamens* not more than half as long as the tepalsegs; anthers small, oblong.

Range.—R. S. Afr.: Cape Province, Eastern Region, Griqualand East, near Kokstad, alt. 1,524 m.

Notes.—Living material for study is needed.

17. Nerine filamentosa Barker, in Fl. Pl. S. Afr. 15: pl. 569. 1935.

Bulb 3 cm. in diam., continuous with a short neck, tunics blackish-brown. *Leaves* 3—4, produced with the flowers, straight or slightly flexuous and spirally twisted, semiterete, slightly channeled above, glabrous, up to 34 cm. long, 2 mm. in diam. *Scape* terete, pubescent with short pluricelled hairs, up to 30 cm. long, 3 mm. in diam. *Spathe-valves* lanceolate, acute, suffused with purple, nearly as long as the pedicels. Umbel 6—9-flowered, flowers bright rose, centripetal, up to 18 cm. in diam. *Pedicels* with minute pluricelled hairs, the young ones reddish, the older ones suffused with green, up to 7 cm. long, 1.25 mm. in diam. *Tepalsegs* linear, acute, circinately revolute above, the margin in the upper half undulate, in the lower half flat, up to 5.5 cm. long, 3 mm. wide. *Stamens* scarcely declinate, finally up to 5.7 cm. long. *Ovary* acutely angled, with a few pluricelled hairs, dark purplish-brown, 3 mm. in diam. *Style* lengthening remarkably, finally as long as the stamens.

Range.—R. S. Afr.: Cape Province; Albany Division; Grahamstown.

Notes.—Barker notes that the tepalsegs "for half of their length are curled back in a circinate manner, leaving the long, almost straight and scarcely declinate, slender filaments protruding as conspicuously

from the flower as they do in the otherwise very different section which contains *N. sarniensis*. It is this last character as well as the slender form of the filaments which suggested the name."

This species shows affinities with *Nerine filifolia*.

18. NERINE PUSILLA Dinter, in Neue Pfl. Deutsch-Suedwest-Afr. p. 48. 1914.

Bulb 3 cm. long, about 1.8 cm. in diam., tunics white. *Leaves* subterete, grass-green, 15—20 cm. long, 8 mm. in diam. *Scape* lateral, 7—9 cm. long, 2 mm. in diam. *Spathe-valves* 2, lanceolate, 2 cm. long. *Pedicels* 2.5 cm. long, minutely hirsuate. Umbel 3—5-flowered; perigone white, rose-colored in lower part, tepalsegs keeled brownish-greenish in upper part. *Tepalsegs* 1.7 cm. long, 3—4 mm. wide, apex bearded on inner side. *Stamens*: 3 inner 1.6 cm. long, 3 outer 1.3 cm. long; filaments declinate-ascending; anthers rose-brown. *Style* declinate-ascending, stigma prominently 3-lobed.

Range.—R. S. Afr.: Damaraland, Gobabis and Steinhausen.

Notes.—Dinter collected this plant in 1912, and cultivated it at Okahandia in Damaraland. He remarks on the great beauty of the species.

19. NERINE TULBAGHENSIS Barker, in Fl. Pl. S. Afr. 15: pl. 565. 1935.

Bulb small, globose, 1.5 cm. long, 1.2 cm. in diam. continued into a short neck. *Leaves* 4—5, present with the flowers (synanthous) subpatent, linear, slightly channeled above, obtuse, dark green, reddening at the base, 6—9 cm. long, 2 mm. wide. *Scape* reddening at the base, 10—12 cm. long, 2 mm. in diam. *Spathe-valves* oblong lanceolate, acuminate, reddish-purple, 1.5—2 cm. long. *Umbel* 2—3-flowered. *Pedicels* glabrous, 1—2.5 cm. long. *Ovary* obtusely angled, 2 mm. in diam. *Tepalsegs* pale pink, recurved and margins undulate towards the apex, 2.2 cm. long, 3 mm. wide. Stamens declinate, finally turned up at the apex, filaments non-appendiculate, as long as the tepalsegs. *Style* declinate, longer than the stamens.

Range.—R. S. Afr.: Cape Province, Tulbach Kloof.

Notes.—According to Barker, *N. tulbaghensis* was formerly included under *Nerine humilis* Jacq., but the leaves are synanthous, and they are very narrow. The whole plant is smaller, including the individual flowers; the differences are sufficient to warrant its being raised to specific rank.

20. NERINE REHMANNII (Bak.)L. Bolus ex Traub, comb. nov.; S. Afr. Gard. 20: 148. 1930, without literature citation.

Syn.—*Hessea rehmannii* Bak., Amaryll. 22. 1888; Barker, Fl. Pl. S. Afr. 3: pl. 120. 1923.

Bulb globose, 1.8 cm. long, 1.5 cm. in diam. continuing into a neck, 1—1.5 cm. long; tunics papery. *Leaves* usually 1, synanthous rarely 2, filiform, 9 cm. long, quite terete or with a shallow channel, glabrous. *Scape* 15 cm. long, terete, glabrous. *Umbel* about 9-flowered, centripetal. *Spathe-valves* 2 mm. long, ovate, acute. *Pedicels* 8 mm. long, terete, glabrous. *Ovary* 2.5 mm. in diam., globose, glabrous, with a single ovule in each cell. *Tepalsegs* 8 mm. long, 1.5 mm. wide, linear, much crisped,

with 3 tepalsegs minutely and bluntly apiculate, and with papillae at the apex. *Stamens*: filaments attached to the base of the tepalsegs, 5 mm. long, terete; anthers 1 mm. long, orbicular, basifixed. *Style* 7 mm. long, terete; stigma 3-lobed, papillose.

Range.—R. S. Afr.: Transvaal.

Notes.—This is a very distinct species.

21. NERINE FILIFOLIA Bak., Bot. Mag. pl. 6547. 1881; Amaryll. 101—102. 1888; Fl. Cap. 6(2): 211. 1896.

Bulb globose, under 2.5 cm. in diam., continued into a short neck, tunics pale. *Leaves* 6—10, contemporary with the flowers, grass-green, very slender, suberect, 15—20 cm. long. *Scape* slender, terete, green, finely glandular-pubescent, up to 30 cm. long. *Spathe-valves* lanceolate, green, under 2.5 cm. long. *Umbel* 8—10—12-flowered, centripetal; perigone deflexed, rose pink. *Pedicels* slender, 2.5—3.8 cm. long. *Ovary* angled, minutely puberulous, brownish-green, 4 mm. in diam. *Tepaltube* 2 mm. long. *Tepalsegs* linear, oblanceolate, unguiculate, 2.5—3 cm. long, 3—4 mm. wide, spreading from the center, margins crisped. *Stamens* declinate, shorter than the tepalsegs; anthers oblong, red. *Style* equaling the longer stamens.

Range.—Orange Free State, Kalahari Region.

Notes.—Plants similar to that figured in Bot. Mag. 6547 have not been collected from Orange Free State since it was taken there by Ayres in 1879. A similar plant, *N. parviflora* (description follows) with a totally different flowering season is known to exist in Cape Province, near Grahamstown.

22. NERINE PARVIFLORA (Barker) Traub, comb. nov.

Syn.—*Nerine filifolia* var. *parviflora* Barker, Fl. Pl. Sl. Afr. 15: pl. 568. 1935; Plant Life 9: 163. 1953.

Bulb oblong-globose, about 2 cm. long, 1.2 cm. in diam. continued into a neck about 1.5 cm. long. *Leaves* 2—3, appearing with the flowers (synanthous), filiform, up to 18 cm. long. *Scape* bright green, minutely glandular-pubescent with pluricelled hairs, 23 cm. long. 2.5 mm. in diam. *Spathe-valves* lanceolate, acute, purplish or yellowish, 2 cm. long. *Umbel* 3—8-flowered, centripetal. *Pedicels* minutely glandular-pubescent with pluricelled hairs, tinged with red-brown, up to 2.5 cm. long, 2 mm. in diam. *Tepalsegs* 2.2. cm. long, 4 mm. wide, bright mauve-pink with a deeper central stripe most pronounced near the base, recurved and undulate in the upper half. *Stamens* declinate, non-appendiculate at the base, shorter than the tepalsegs, up to 2 cm. long; anthers dark reddish-purple before dehiscing, 2.5 mm. long. *Ovary* sub-acutely angled, minutely glandular-pubescent, dark reddish-brown; style at first short, and straight, lengthening and recurving in the older flowers, 1.4 cm. long; stigma capitate.

Range.—R. S. Afr.: Cape Province, near Grahamstown.

Notes.—According to Barker (1935), the main characteristics of *N. filifolia* are its few filiform or thread-like leaves that are contemporary with the flowers, the glandular pubescence on the scape, the pedicels and the ovary; the deep color of the zygomorphic perigone, where tepalsegs

diverge very gradually from the center of the flower, and the declinate stamens shorter than the tepalsegs, and the *absence* of appendages at their bases. All of these characters are exemplified in *N. parviflora,* which differs in having smaller flowers, and a much later flowering season, namely in August (Southern Hemisphere), while that of *N. filifolia* extends from January to June(Southern Hemisphere). Thus *N. parviflora* is reproductively isolated from *N. filigolia,* and is apparently evolving along unique lines, and merits specific rank.

Section IV. **APPENDICULATAE** Traub

Stamen-filaments alternating with scales at the base; or appendiculate at the base, or appendages forming a staminal cup at the base. Nomenifer: *N. appendiculata* Bak.

23. Nerine frithii L. Bolus, in Ann. Bolus Herb. 3: 79. 1921; Fl. Pl. S. Afr. 18: pl. 691. 1938.

Bulb ovoid-globose, 2 cm. long, 1.7 cm. in diam. *Leaves* often only 2, contemporaneous with the flowers, subfiliform, channeled above, up to 15 cm. long, 1—1.5 mm. wide. *Scape* terete, up to 20 cm. long. *Spathe-valves* long-oblong, long-attenuate, 2.5—3 cm. long; bracteoles 1—1.5 cm. long, thread-like, membranous. *Umbel* 5—7-flowered; perigone pinkish. *Pedicels* pink in the upper ¾, green below. *Ovary* obovate, with 2 ovules per locule. *Tepaltube* very short. *Tepalsegs* spreading, at length recurved, linear, acute, with undulate margins, 1.5 cm. long, 4 mm. wide. *Stamens* declinate, filaments 3.5—6 mm. long, appendiculate at the base, forming a cup 3 cm. long, somewhat lacerated above, with two lobes usually much exceeding the others.; anthers 4 mm. long. *Capsule* globose, 8 mm. in diam.

Range.—R. S. Afr. Cape Province, Kalahari Region, Griqualand West, Kimberley Division, Riverton; Orange Free State, Hoopstadt.

Notes.—According to Bolus(1938), this species is allied to *N. appendiculata* Bak., but may be distinguished by the almost filiform leaves, glabrous pedicels, and fewer-flowered umbel and smaller flowers.

24. Nerine transvaalensis L. Bolus, in F. Pl. S. Afr. 18: sub pl. 683, in obs.; sub pl. 681. 1928, in obs.; et in adnot. 1938.

Syn.—"Nerine frithii L. Bolus", Fl. Pl. S. Afr. 4: pl. 132. 1924, misidentified, non L. Bolus (1921); Plant Life 9: 164. 1953.

Bulb ovoid-globose, 2 cm. long, 1.7 cm. in diam. *Leaves* present with the flowers (synanthous), very often only 2, up to 15 cm. long, 1—1.5 mm. wide, subfiliform, channeled above. *Scape* up to 20 cm. long, terete. *Spathe-valves* oblong, long-attenuate, 2.5—3 cm. long; bracteoles thread-like, 1—1.5 cm. long. *Umbel* 5—7-flowered. *Pedicels* up to 3 cm. long. *Ovary* obovate; 2 ovules per locule. *Tepalsegs* spreading, at length recurved, linear, acute, with undulate margins, 1.5 cm. long, 4 mm. wide. *Stamens* declinate, filaments 3.5—6 mm. long, appendiculate at the base, forming a staminal cup, 3 mm. long, somewhat lacerated above, with two lobes usually much exceeding the others; anthers 4 mm. long. *Capsule* globose, 8 mm. in diam.

Range.—R. S. Afr.: Transvaal.

Notes.—According to L. Bolus(1938), although *N. transvaalensis* is closely allied to *N. frithii*, the former is sufficiently different to rank as a distinct species because of its narrower tepalsegs, longer and more slender filaments, and the differently shaped stamen-appendages.

25. Nerine hesseoides L. Bolus, in Fl. Pl. S. Afr. 18: pl. 683. 1938; Dyer, Herbertia 15: 14, pl. 315, fig. 2. 1948.

Plant glabrous, 17—25 cm. tall. *Bulb* ovate, up to 3 cm. long, 1.7 cm. in diam., continued into a neck, tunics thin, papery. *Leaves* 2—7, present with the flowers (synanthous), linear, flat or slightly sulcate above, rounded below, up to 18 cm. long, 1—1.5 mm. wide. *Scape* terete, up to 25 cm. long, scarcely 2 mm. in diam. *Spathe-valves* up to 2.5 cm. long. *Umbel* 6—14-flowered, centripetal. *Pedicels* ascending or erect, 2—3 cm. long. *Tepalsegs* regularly placed as in the genus *Hessea*, linear, widened upwards, broadest near the middle, obtuse, margins conspicuously undulate in the lower part, usually up to 1 cm. long, up to 3.5 mm. wide. *Stamen-filaments* at first decurved, then erect, finally almost regularly disposed in the flower, unequal in length, 4—5.5 mm. long, appendiculate at the base, the appendages almost free to the base, somewhat spreading upwards, narrow, acuminate, usually entire, up to 2 mm. long; anthers before dehiscence 1—2 mm. long, pollen whitish. *Style* at first decurved, finally curved upwards; stigma minutely lobed. *Ovary* at first acutely angled, 1.5—2 mm. long, 1.5 mm. in diam. *Capsule* globose, 6 mm. in diam.

Range.—R. S. Afr.; Griqualand West; Hay Division, Rocklands.

Notes.—According to Bolus(1938), there are four allied species, occurring in the north . . . *N. rehmannii*, *N. transvaalensis*, *N. frithii* and *N. hesseoides*. They are all glabrous and have in common slender synanthous leaves, flowers which rank among the smallest in the genus, and tepalsegs distinctly broadest near the middle, with margins closely and conspicuously undulate in the lower part, and obscurely so upwards. *N. rehmannii* is distinguishable by its white perigone and non-appendiculate filaments; *N. transvaalensis* has narrow tepalsegs and longer and more slender filaments than *frithii* and *hesseoides*, and finally, *N. hesseoides* differs from *N. frithii* in its smaller flowers, with the perigone actinomorphic throughout the entire life of the flower, and entire stamen-appendages which are separate from one another almost to the base.

26. Nerine gaberonensis C. E. B. Bremekamp & A. A. Obermyer, in Ann. Transvaal Mus. 16: 409. 1935; Plant Life 9: 75. 1953.

Bulb globose, 1.5—2 cm. in diam., continued into a cylindric neck 2.5—3 cm. long; tunics gray. *Leaves* filiform, glabrous, up to 10 cm. long, 1 mm. in diam. *Scape* terete, glabrous, about 15 cm. long. *Spathe-valves* (triangular), acute, 1.5 cm. long, 3 mm. wide. *Umbel* 14—15-flowered, centripetal; perigone wine-red, 2 cm. long. *Pedicels* terete, glabrous, 1.5—2.5 cm. long. *Ovary* globose, glabrous, 2 mm. in diam., 1 ovule per locule. *Tepaltube* 3 mm. long. *Tepalsegs* linear, or linear-oblanceolate, 3-nerved, obtuse, undulate, 1.7 cm. long, 2 mm. wide. *Stamens* inserted in the throat of the tepaltube, shortly connate at the

base, in two series, the 3 longer 1.7 cm. long, the 3 shorter 1.4 cm. long; anthers 3 mm. long, oblong, emarginate at the apex and base, dorsifixed. *Style* filiform, 2.2. cm. long; stigma obscurely tricuspidate. *Capsule* deeply 3-lobed, membranous.

Range.—Botswana, Gaberones.

Notes.—According to the authors of this species, *N. gaberonensis* is closely related to *N. rehmannii,* but it is distinguished by the short tepaltube, the dark wine-colored and somewhat larger flowers and the gray bulb tunics. The spongy character of the bulb-neck protects the young shoot in the daytime against the excessive temperatures of the surface layers of the soil.

First collected by G. van Son, March, 1930.

27. Nerine pancratioides Bak., in Gard. Chron. ii(1891)576; Fl. Cap. 6(2) : 213—214. 1896; O'Brien, in Flora and Sylva 3 : 122. 1905.

Bulb unknown. *Leaves* above 30 cm. long, bright green, subterete in the lower part, nearly flat towards the apex, 2 mm. in diam. *Scape* robust, terete, up to 60 cm. long. *Spathe-valves* lanceolate, 2.5 cm. long. *Umbel* 10—20-flowered, centripetal; perigone pure white, 2—2.5 cm. long. *Pedicels* 2.5—3.8 cm. long, densely pubescent. *Tepaltube* short. *Tepalsegs* oblanceolate, 4 mm. wide, not crisped. Stamens less than half as long as the tepalsegs. Stamens declinate; filaments filiform, alternating with large, square bifid scales; anthers small, black, oblong. *Style* very short.

Range.—R. S. Afr.: Natal, in a ravine on a hill near Greytown, alt. 1,220—1,524 m.; and Weenen County at Waterfall No. 7, alt. 1,524—1,828 m.

Notes.—Living material is needed for study.

28. Nerine appendiculata Bak., Gard. Chron. ii(1894)336; Fl. Cap. 6(2) : 213. 1896; van Druten, Fl. Pl. S. Afr. 31 : 1211. 1956.

Bulb ovoid, 2.5 cm. long, 2 cm. in diam. *Leaves* 1—3, produced with the flowers, or occasionally absent, linear, deeply channeled, up to 45 cm. long, 2.5—5 mm. wide. *Scape* glabrous, terete, slightly twisted, up to 80 cm. long. *Spathe-valves* 2, lanceolate, membranous, reddish, 3.5 cm. long. *Umbel* 10—20-flowered, centripetal. *Pedicels* 3.5—5 cm. long, tinged with reddish-brown, very finely and densely pubescent with cellular hairs; bracteoles filiform, up to 3 cm. long. *Ovary* 3-angled, 6.4 mm. in diam., pubescent; ovules 2—4 per locule. *Tepaltube* very short. *Tepalsegs* oblanceolate-linear, 2.5—3 cm. long, 3—5 mm. wide, upper half crisped, minute pubescence at the base which sometimes extends along the keel a short distance; the color varying from pale to deep rose (red according to Baker), with deeper mid-vein. *Stamen-filaments* pale to deep rose in color; three 1.5—2 cm. long, three a little shorter, appendages conspicuous, white, up to 1 cm. long, with 2—4 linear teeth; anthers black, 3.5 mm. long. *Style* 8—17 mm. long; stigma minutely 3-lobed.

Range,—R. S. Afr.: Natal.

Notes.—First described by Baker from a cultivated specimen sent to him by Jas. O'Brien in 1894; the more detailed description by van Druten supercedes the sketchy one by Baker.

29. Nerine masonorum L. Bolus, in S. Afr. Gard. 20: 148, fig. A.

1930; Barker, in Fl. Pl. S. Afr. 15: pl. 570. 1935.

Bulb oblong-globose, 1.5 cm. in diam., continued into a short neck, tunics membranous, dark brown. *Leaves* 4—5, appearing with the flowers (synanthous), suberect or spreading, filiform, concave above, convex below, bright green, smooth, up to 20 cm. long, 1.5 mm. wide. *Scape* terete, minutely pubescent with pluricelled hairs, up to 22 cm. long, 2.5 mm. in diam. *Spathe-valves* lanceolate, acute, tinged with purplish-brown, 2.5 cm. long. *Umbel* 4—12 flowered. *Pedicels* pubescent, 1.2—3 cm. long. *Tepalsegs* up to 1.3 cm. long, 3 mm. wide, rose-pink with a darker central stripe, undulate, finally usually all recurved towards the back of the flower and away from the stamens. *Stamens* declinate, with two small lanceolate appendages attached to the base of the filaments, up to 7 mm. long. *Ovary* sub-acutely angled, glabrous, 2.5 mm. in diam.; style declinate, shorter than the stamens, even in the old flowers; stigma minutely 3-lobed, capitate.

Range.—R. S. Afr.: Cape Province, Transkei, near Mquanduli.

Notes.—According to Barker, the two nearest allies of *N. masonorum* are *N. parviflora* and *N. frithii*. It has the slender synanthous leaves common to both allies, and the glandular pubescence of *N. filifolia*. But the small flowers with the final position of the tepalsegs resulting in a perigone flattened in the center, the short stamens appendiculate at the base and throughout exceeding the style in length, are all features shared with *N. frithii*, which differs, however, in being quite glabrous, with more spreading and stiffer pedicels, tepalsegs definitely widest just above the middle, and stamen-appendages much larger and incised.

30. Nerine gracilis R. A. Dyer, in Fl. Pl. S. Afr. 17: pl. 679. 1937; Herbertia 15: 13—14, pl. 315, fig. 1. 1946(1948).

Bulb elliptic-globose, 1.5—2 cm. in diam., continued into a neck 3.5—5 cm. long, tunics membranous. *Leaves* 3—5, contemporary with the flowers (synanthous), up to 30 cm. long, 1.5—2 mm. thick, filiform, subterete, concave or shallowly canaliculate above, very minutely papillate. *Scape* terete, slender, shorter than the leaves, up to 20 cm. long, 2—2.5 mm. thick, very minutely papillate and occasionally with a few scattered hairs. *Spathe-valves* narrowly lanceolate-acuminate, about 2 cm. long. *Umbel* 8—10-flowered, centripetal, the anthers of the flowers maturing before the pistil (protrandrous). *Pedicels* 4—7 cm. long, 1 mm. in diam., terete. *Ovary* triangular. *Tepalsegs* about 1 cm. long, setepalsegs about 4.5 mm. wide, petepalsegs slightly broader, elliptic-oblong, rose-pink (Ridgway XII), green keeled above the middle, margins undulate, minutely cuspidate at the apex. *Stamen-filaments* appendiculate behind the base with oblong deeply 2—3-lobed rarely fimbriate process, at first suberect, later decurved after dehiscing of anthers; anthers oblong, 2.5 cm. long the 3 opposite the petepalsegs maturing before the others. *Style* at first decurved, later erect; stigma minutely trilobed. *Capsule* obtusely trilobed or subglobose, with 1—2 subglobose seeds per locule.

Range.—R. S. Afr.: Transvaal, between Bethal and Ermelo, in grassland, flowering in February (Southern Hemisphere).

Notes.—According to Dyer(1937), *N. gracilis* differs from *N. frithii*

in the smaller, more regularly shaped flowers, and in the short but comparatively broad tepalsegs. It is generally glabrous, but may have a few scattered, transparent hairs, and when fresh is very minutely papillose on both leaves and scape; the papillae, however, disappear in drying.

HYBRID NERINES

William Herbert was among the first to work in this field. As shown in Table 3, Herbert recognized seven *Nerine* hybrids, but according to Baker (1896), these had all disappeared by the 1890's. Baker (1896) gave a list of 14 hybrids which were current at that time as shown in Table 3, but these apparently did not include all of the hybrids grown in his day. However, *Nerine* hybrids not included in his list were few in number.

Table 3. **Nerine** hybrids reported by Herbert (1837) and Baker (1896).

I. HYBRIDS REPORTED BY HERBERT (Amaryll. 1837)

1a. Umbel centripetal:

1. x **mitchamiae** Herb. (curvifolia x undulata); Syn.—**versicolor** Herb.
2. x **haylockii** Herb. (curvifolia x undulata)
3. (pulchella x undulata)

1b. Umbel centrifugal:

4. x **spofforthiae** Herb. (venusta x undulata)

1c. Type of umbel undetermined:

5. (pulchella x humilis)
6. (humilis x undulata)
7. (curvifolia x venusta)

II. NERINE HYBRIDS LISTED BY BAKER (Fl. Cap. 1896)

1. x **amabilis** (pudica x humilis)
2. x **camii** (curvifolia x undulata)
3. x **atrosanguinea** (plantii x flexuosa)
4. x **cinnabarina** (fothergillii x flexuosa)
5. x **o'brienii** (pudica x plantii)
6. x **carminata** (pudica x plantii)
7. x **caerulea** (pudica x plantii)
8. x **erubescens** (flexuosa x undulata)
9. x **elagans** (flexuosa x rosea)
10. x **meadowbankii** (sarniensis x fothergillii)
11. x **manselllii** O'Brien (flexuosa x fothergillii)
12. x **roseocrispa** Cam (undulata x flexuosa)
13. x **excellens** T. Moore, in Florist 1887, pl. 567 (flexuosa x humilis)
14. x **stricklandii** O'Brien, Gard. Chron. xvi (1894)690 (curvifolia x pudica)

Since 1896, no attempt was made to list hybrid nerines until the American Amaryllis Society (now affiliated with the American Plant Life Society), was organized in 1934, when all named amaryllid clones, including *Nerine* hybrids, were again recorded or registered.

The registration activity of the American Plant Life Society was recognized in 1962, when at the XVIth International Horticultural Congress, held at Brussels in August-September, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of *Nerine* (see Plant Life 1963, page 63).

Emma D. Menninger, Registrar for Nerine Clones, prepared for the American Plant Life Society, a "Catalog of Hybrid Nerine Clones, 1882-1958" which was published in Plant Life 16: 63—74. 1960. Annual supplements have been published in succeeding volumes. In 1966 a revised registration form, worked out by Mrs. Emma D. Menninger, was adopted. The number of named hybrid *Nerine* clones is more than 350.

A comprehensive list of chromosome numbers of *Nerine* hybrids was published by E. K. Janaki Ammal and Margery Bridgwater in the Journal of the Royal Horticultural Society for October, 1951 to which the reader is referred.

Recently, The Nerine Society was organized in England with C. A. Norris, Clent House, Clent, Worcestershire, Great Britain as President and Editor. The first bulletin was published in 1966.

Thus, the Nerines are at long last receiving the attention that they deserve.

BREEDING FOR SIMPLIFIED NERINE CULTURE

The popularization of hybrid Nerines has been retarded by difficulties experienced in mastering cultural problems. The writer has experimented in this area, and limited success has been achieved at least in one direction. This concerns evergreen hybrids which can be grown at least in southern California under ordinary garden and pot culture without resting the bulbs. The clones obtained so far are sterile, but in a few cases some pollen is produced, and there is the possibility that some fertile hybrids may be obtained in the future. The hybrids are all quite beautiful ornamental plants.

Nerine × **traubianthe** Moldk.

(In Plant Life 23: 61. 1967.)

Since various *Nerine* species grow under different climatic conditions, the hybrids developed from them respond best to the culture similar to that needed by one or the other of the parents. The problem is to choose the right parents.

In order to simplify cultural requirements, the writer selected the evergreen *Nerine filifolia* (seed parent) and crossed it with such hybrid clones as 'Rosalba', 'Inchmery Kate', etc. This has given *evergreen, free-flowering* progeny intermediate between the parents, having linear leaves, and very long scapes due to hybrid vigor, and which can be treated as ordinary pot plants (grown in *plastic pots*) that are watered throughout the year. They invariably bloom in September through early November under this neglectful culture. When he has forgotten that they are around, they will surprise the gardener by the profuse flowering. Some of these clones (such as *N. filifolia* x 'Rosalba') increase rapidly by the splitting of the bulbs vertically; others (such as *N. filifolia* x 'Inchmery Kate', with thicker scapes) will have to be *cut into quarters vertically* after flowering and replanted in order to obtain the needed vegetative increase.

At first thought, the relatively long scapes might appear to be a disadvantage. However, when *several bulbs* are grown in a pot, the scapes are a little shorter; and as cut flowers the long scapes are an advantage since the florist or flower arranger may cut them to any desired length.

This series of hybrids, included under *Nerine* x *traubianthe*, is recommended to the amateur and the florist.

Other hybrid combinations, using different parents of easy culture, with the objective of simplifying culture have also been made, and the results will be reported later.

PLANT LIFE

AMARYLLIS YEAR BOOK

1968

Amaryllis vittata

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HAMILTON P. TRAUB
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CORRIGENDA

PLANT LIFE Vol. 23, 1967

SUPPLEMENT—REVIEW OF THE GENUS NERINE

Page 3, text, 13th line, delete "it" after replaced.
4th par. 2nd line, change "Table 1" to "Tables 1 & 2"
Page 6, under CARYOLOGY, 5th line, change Table 2 to "Table 3". Change table heading "Table 2" to "Table 3."
Page 10, under 23b., 2nd line, change "*N. alata*" to "*N. alta*" under 29b, change "11. *alata*" to "*N. alta*"
Page 14, 9 lines from bottom, change "2c." to "2e."
Page 17, under 4g., Notes, 2nd line, change "species" to "variety"
Page 21, change "11. *alata*" to "11. *alta*"
Under "Notes", change "*Nerine alata*" to "*Nerine alta*"

PLANT LIFE LIBRARY—continued from page 166.

DRIFTWOOD MINIATURES, by Florence M. Schaffer. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1967. This charming book on creating driftwood miniatures represents a widening viewpoint in this field. The topics discussed include rocks, cones, nuts, hulls, pods, seeds, seed heads, roots, spathes, bracts, tendrils, coral, fungi, seaweed, coral and shells. It is written for a wide audience, including four-year olds, teenagers, young adults and senior citizens. This beautifully illustrated book is very highly recommended.

NEW IDEAS FOR CHRISTMAS DECORATIONS, by Nora Fields. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1967. Pp. 160. Illus. $4.95. This fascinating book on new ideas for Christmas decorations with greens, pods and cones by an authority in the field of education fills a definite need. It provides creative work for the members of the family in celebrating the Holiday season. Highly recommended.

HOW TO PLAN & PLANT YOUR OWN PROPERTY, by Alice R. Ireys. William Morrow & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 182. Illus. $7.95. This is an outstanding new type of book on landscape design which provides practical directions. The beautiful and practical illustrations alone are worth the price of the book, which is divided into three parts: (a) fundamentals, planting design, etc., (b) plans for landscaping various types of property; and (c) gardening details. This delightful and useful text is very highly recommended.

FLOWERS FOR YOUR CHURCH, by Adelaide B., and Lois Wilson. William Morrow & Co., 425 Park Av. S., New York 10016. 1967. Pp. 148. Illus. $6.95. This is the first complete guide for the arrangement of flowers in traditional and modern church buildings. This profusely illustrated text by two outstanding authorities is very highly recommended.

GREENHOUSE GARDENING FOR FUN, by Claire L. Blake. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 256. Illus. $6.95. This book has been planned as a complete guide to greenhouse gardening for the amateur and sub-professional. The book is divided into four parts: (a) the program of plants to grow; (b) the first year-program, and more advanced plans; (c) plants to grow in the greenhouse; and (d) useful lists and guides. Highly recommended.

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PLANT LIFE, VOL. 24, NO. 1, January, 1968

AMARYLLIS
YEAR BOOK
1968

Year Book of
The American Amaryllis Society
35th Issue

General Amaryllid Edition

EDITED BY
Hamilton P. Traub
Harold N. Moldenke

THE AMERICAN PLANT LIFE SOCIETY
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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 167.]

PREFACE

The cover design, by Prof. Penrith B. Goff, of the University of Kentucky, represents *Amaryllis aulica* as grown by Sam Caldwell in Tennessee from bulbs imported by Robert D. Goedert from South America. Prof. Goff is to be congratulated again on another beautiful cover.

This thirty-fifth edition of the AMARYLLIS YEAR BOOK is dedicated to Dr. Robert P. Kahn, the noted pathologist in the United States Department of Agriculture, who received the 1968 WILLIAM HERBERT MEDAL in recognition of his outstanding contributions toward the advancement of the amaryllids. He demonstrated the mosaic virus disease in *Amaryllis* L., for the first time. This opens the path for its eventual control and eradication. Dr. Kahn contributes a charming autobiography and a review of the researches on *Amaryllis* mosaic virus disease from 1960 to 1967 in the present issue. The HERBERT MEDAL is presented to him with the congratulations of all the members.

It is our sad duty to report the death of prominent members of the Society.

Mrs. Mary G. Henry, of Gladwyne, Penna., an outstanding worker in the field of the amaryllids, died on April 16, 1967, while on a collecting trip in the Wilmington, North Carolina area. The readers should look up the autobiography which she contributed to Plant Life 1950 on the occasion when the HERBERT MEDAL was awarded to her. Her article on *Agapanthus africanus* var. *henryae* Traub, in the present issue is perhaps the last contribution which she wrote. It is fitting for all of the members in the North, South and elsewhere to grow this fine gem, the *pure white* miniature *Agapanthus africanus* var. *henryae*, to keep the memory of Mrs. Henry fresh in the years to come. The plant is hardy as far north as central Pennsylvania, is of easy culture, and can be increased from seeds and offsets. Material will be furnished to Prof. Claude W. Davis, University Hills Nursery, 470 Delgado Drive, Baton Rouge, La. 70808, so that members will be able to obtain it. However, they should give Prof. Davis a little time to work up a stock.

Mr. Morris W. Clint, the husband of Mrs. Katherine Clint, who together introduced many amaryllids from Mexico, died on April 8, 1967. Mr. Edward F. Authement, our efficient and beloved Registrar of Amaryllis names, died on July 20, 1967; and Mrs. Charlotte M. Hoak, well known to all amaryllid enthusiasts for her work with amaryllids, died on Sept. 3, 1967. In Memoriam notices appear in the present issue.

Again, Mr. Goedert reports on the 1966-1967 Amaryllis Season. Dr. Joseph C. Smith writes about new Amaryllis species collected by Dr. Ruppel in South America. Sam Caldwell reports on *Amaryllis aulica;* Mr. Mertzweiller, Buchmann and Fesmire discuss their Amaryllis breeding projects. Mr. Tisch writes on his experiences with amaryllids; Mr. Doran reports on *Amaryllis reginae* and *Crinum erubescens* in South America; and Mr. Buck writes about the appropriate use of Amaryllis blooms at a spring wedding. Mr. Beckwith D. Smith shares his enthusiasm on acquiring the Blue Amaryllis, *Worsleya rayneri.*

Mr Buck writes about his Daylily trip to Chicago, Hemerocallis breeding and the rare Bahama Islands *Hymenocallis*. Mr. Paul H. Williams examines the possibilities of various *Rhodophiala* species; Mr. Hannibal reports on *Crinum schmidtii;* and Mr. Corbett considers the asexual propagation of *Lycoris squamigera*. Dr. Zorbach has found that the honey of *Crinum asiaticum* is mainly sugar (sucrose). Prof. Ravenna contributes *Nothoscordum* notes. Mr. Caldwell provides valuable *Lycoris* notes, and give us the first *Lycoris* blooming chart.

Dr. Howard writes about his plant exploration trips into Guatemala and Mexico. There are reports on the 1967 Official Amaryllis Shows; contributions on Amaryllis show schedules, and the staging of Amaryllis shows by Mrs. Pickard and Mr. Mahan. There are still other contributions as shown by the table of contents.

Contributors to the 1969 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1968, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.

December 15, 1967,
5804 Camino de la Costa,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

HERBERT'S "AMARYLLIDACEAE" (1837) REPRINTED

In the 1966 issue, the firm Verlag Von Cramer, 694 Weinheim, West Germany, reported that Herbert's "Amaryllidaceae" (1837), with an introduction by H. P. Traub, would be reprinted. Due to unavoidable circumstances, the publication has been delayed, but word has been received (December 1967) that the book will be available in the spring of 1968. Pre-publication or subscription price is $30.00; after publication the price will be $40.00. Send orders directly to the publisher.

PLANT LIFE LIBRARY—continued from page vi.

THE FRAGRANT YEAR, by Helen Van Pelt Wilson and Leonie Bell. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 306. Illus. $10.00. This comprehensive book on fragrant plants by two outstanding authorities will be welcomed. The topics discussed include classification of scents; fragrant plants for the winter garden; for spring, early summer, mid-summer, and autumn; and cool window gardens. Highly recommended.

NEW TRENDS IN DRIED ARRANGEMENTS & DECORATIONS, by Mabel Squires. M. Barrows & Co., 425 Park Av. S., New York, N. Y. 10016. 1967. Pp. 128. Illus. $3.95. This text by an outstanding authority will be welcomed. The topics covered include contemporary arrangements; still life; collage; assemblage; abstract design; new variations for Christmas; sources of plants, and ways to dry them. Highly recommended.

PLANT LIFE LIBRARY—continued on page 20.

Dedicated to
Robert Phillip Kahn

HERBERT MEDALIST—ROBERT PHILLIP KAHN

ROBERT PHILLIP KAHN

AN AUTOBIOGRAPHY

I first became interested in plants as a senior in high school during weekend exposure in a relative's florist business. However, since my favorite subject in school was economics, I enrolled at Northwestern University, planning to major in some area of commerce. During my first semester, since I found a course in botany more to my liking, I transferred to the College of Agriculture, University of Illinois. I took all the required plant courses but deferred until a later date all required animal courses. In 1943, after 2½ years of college I entered the Army, and in 1949 I graduated from Officer's Candidate School. After 3½ years service including one year in Japan, I returned to the University of Illinois. I had no interest in the animal science courses so I transferred to the Department of Botany, receiving the B.A. degree with honors in botany in 1948 and a Ph. D. degree in plant pathology in 1951.

This explains how a "city boy" became interested in agriculture—an accounting I'm frequently called upon to submit.

I was born in Chicago on April 20, 1924, the son of Charles S. Kahn, a dentist, and Edith K. Kahn. I was raised near Lake Michigan in apartments surrounded by a maze of concrete and asphalt with plant life only to be found in the city parks and conservatories with an occasional privet hedge in front of buildings.

I married Judith Aronson, an art major at the University of Wisconsin in 1947, shortly after she received her B.A. degree. Our four boys, Charles, James, Andrew, and Jeff were born in 1951, 1953, 1956, and 1960.

I have been employed by the U. S. Government as a plant pathologist since 1952. During the past 10 years I have been with the Plant Quarantine Division, Agriculture Research Service, U. S. Department of Agriculture. I am presently responsible for detecting obscure plant pathogens, particularly viruses in vegetatively-propagated plants imported by the Department for research purposes. Many genera imported from foreign countries are prohibited by quarantine regulations because of hazardous pests or pathogens that do not occur in this country. The only exception is that prohibited plants such as potato, cherry, and many ornamentals may be imported under proper safeguard by the Department of Agriculture for research or educational purposes. The safeguards we use are based on growing the imported plants under strict quarantine for at least 2 years during which time they are checked for pests and pathogens. Most pests and pathogens can be detected by observation of symptoms or signs. However, observation is not satisfactory for detecting viruses. Neither the presence nor the absence of virus-like symptoms is indicative of the presence or absence of virus in plants. Many varieties of plants can be infected with virus without

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showing symptoms. Thus, like "Typhoid Mary", they act as carriers and could serve as sources for the infection of susceptible varieties. Many virus-like symptoms are not necessarily incited by viruses. For example, chlorosis might be incited by genetic factors, nutritional imbalance, or by virus infection. Similarly, variegation could be virus induced or of genetic origin, or even caused by spray injury.

I am therefore, a specialist in the detection and identification of viruses, particularly latent viruses and in addition, I conduct research in methodology to improve methods for detecting and characterizing viruses. Such research may lead to the description of new strains of already described viruses (such as the *Eucharis* mottle strain of tobacco ringspot virus) or to new undescribed viruses.

In addition to the virus detection program and conducting research to support this project, I am also interested in plant quarantine pathology. I have been fortunate in being able to participate in international symposia on this subject at the Glasshouse Crops Research Institute, Littlehampton, England in 1963; the Plant Virology Institute at Wageningen in the Netherlands in 1965; at the Escuela Agricola Pan Americana in Honduras in 1966, and most recently in an FAO-International Biological Program Symposium in Italy in September 1967.

It was as a specialist in virus detection and in plant quarantine that I first encountered Amaryllids. The Louisiana Society for Horticultural Research, through the late Dr. Ira Nelson, asked the Department of Agriculture to send a specialist to advise on quarantine matters in connection with a collection of imported amaryllids maintained at the Southwestern Louisiana Institute, West Lafayette. The Louisiana Society for Horticultural Research sponsored a trip for me to observe Dr. Nelson's collection and to make phytosanitary recommendations.

Since then I have maintained a small collection of foreign and domestic amaryllids, many of which were submitted by readers of this journal. From this collection I isolated 4 viruses:

(1) *Eucharis* mottle strain of the tobacco ringspot virus—a previously unreported and undescribed strain isolated from *Eucharis candida* from Peru.

(2) An as yet unidentified virus isolated from a domestic plant of *E. grandiflora*.

(3) Amaryllis mosaic virus.

(4) Cucumber mosaic virus.

As an outgrowth of investigations within this group, I published 4 papers, 3 of which were in collaboration with other colleagues:

1. Kahn, R. P. 1960. The present status of the amaryllis mosaic disease in the United States. Louisiana Society for Horticultural Research, Bull. No. 5, pages 24-30.

2. Kahn, R. P. and F. F. Smith. 1963. Transmission of a virus inciting amaryllis mosaic symptoms. Plant Life 19:133-143.

3. Kahn, R. P. and H. A. Scott. 1964. Serological relationships of cucumber mosaic virus and certain virus isolates that incite amaryllis mosaic symptoms. Phytopathology 54:360-362.

4. Kahn, R. P., H. A. Scott, and R. L. Monroe. 1962. *Eucharis* mottle strain of tobacco ringspot virus. Phytopathology 52:1211-1216.

In the first paper, I reviewed the literature and status of amaryllis mosaic in the U. S., and suggested control measures. In the second, we reported isolation of 2 mechanically transmissible viruses from amaryllids. We identified one of the viruses as cucumber mosaic virus and confirmed its transmission by aphids. In the third paper, we confirmed this identification on the basis of serological tests. In the fourth paper, we described a new strain of the tobacco ringspot virus isolated from *Eucharis*. The new strain was of academic interest to other plant pathologists because it did not incite ringspot symptoms in tobacco, yet serological relationships showed it was, indeed, a strain of the tobacco ringspot virus.

I wish to thank the members of the American Plant Life Society for awarding me the William Herbert Medal for 1968.

AMARYLLIS VIRUS RESEARCH—1960-1967

ROBERT P. KAHN

Plant Quarantine Division, Agricultural Research Service, USDA, Glenn Dale, Maryland

When the author reviewed the status of *Amaryllis*[1] mosaic disease as of 1960 (3), he recommended control measures that were based on insecticides, resistant or tolerant species or varieties, and phytosanitation. These recommendations followed the concept that control of virus diseases is generally based on prevention rather than cure.

This 1960 review was concluded with the following statements concerning future research: "A survey of the published literature of *Amaryllis* mosaic and its causal virus suggests to the author that *Amaryllis* enthusiasts may have to learn to co-exist with the *Amaryllis* mosaic disease, especially under field conditions. The situation may be alleviated if future research can develop virus-resistant or tolerant lines, provide a virus indexing program, or ascertain the mode of transmission. More information concerning transmission is essential to place virus-control measures on a more specific basis than may now be recommended." This missing information is now available as a result of reports that have appeared since 1960.

It is the objective of this paper (1) to review these reports and thus to bring amaryllid growers up-to-date with respect to *Amaryllis* virus research and (2) to suggest areas of future research and a means by which such research might be stimulated.

[1] **Amaryllis** L. (1753), first typified by Herbert, 1819; (syn.—**Hippeastrum** Herb. 1821).

RESEARCH 1960-1967

As of 1960, we knew that the tomato spotted wilt virus (TSWV) infected amaryllids and we suspected that the *Amaryllis* mosaic was incited by a virus. A virus was implicated because of virus-like symptoms, the presence of microscopic inclusion bodies in cells, and natural spread under field conditions but there was no actual proof of a virus. No one had reported that an infectious agent could be isolated from a plant with mosaic symptoms and then be transmitted to a healthy plant which would subsequently develop the same mosaic symptoms. TSWV was known to be transmitted by thrips and mechanically (rubbing sap from an infected plant onto a healthy plant). The method of transmission of the incitant of *Amaryllis* mosaic was unknown although insects were suspected. Reports of seed transmission were conflicting. The earlier work on amaryllid virus has already been reviewed (1, 3, 4, 7).

In 1966 the author and Dr. F. F. Smith reported the isolation of 2 viruses from *Amaryllis* with mosaic symptoms (4). One virus which could be transmitted to healthy *Amaryllis* as well as other plants such as tobacco was identified as cucumber mosaic virus (CMV). We showed that the CMV was aphid-and mechanically-transmitted from *Amaryllis* to *Amaryllis* and other test plants but the virus was not seed transmitted. Isolation of CMV from amaryllids by other workers has been reported (See Literature Cited 1, 2, 3). Under an electron microscope CMV is characterized by spherical particles. A second virus was isolated which could be mechanically-transmitted from *Amaryllis* to *Amaryllis* with the production of typical mosaic symptoms but the virus could not be transmitted to other plants. The second virus was not CMV.

In 1967, Brants and van den Heuvel (1) isolated a virus from *Amaryllis* plants with mosaic symptoms which showed a characteristic flexuous rod shape under the electron microscope. The virus was not transmitted by aphids but was transmitted through a low percentage of the seed. The virus of Brants and van den Heuvel was not CMV or TSWV.

Dr. D. H. M. van Slogteren, Jr., at the Flower Bulb Laboratory, Lisse, the Netherlands (unpublished data) has also isolated a rod-shaped virus from amaryllids and has developed an antiserum which is useful in serological testing. This antiserum reacts with the second virus isolated by Kahn and Smith showing that both van Slogteren's and the Kahn and Smith virus are related. Dr. M. K. Corbett, University of Maryland (unpublished data) has also purified a rod-shaped virus from sap obtained from mosaic infected plants. After purification, a procedure whereby the virus as separated from other components of the cell sap by chemical and physical means, the virus would infect other non-amaryllid test plants suggesting that some amaryllid sap extracts contain a virus inhibitor which may interfere with mechanical transmission.

Three viruses found in *Amaryllis* and some of their characteristics are indicated in Table 1.

Table 1. Some characteristics observed in viruses found in **Amaryllis** L.

CHARACTERISTICS	VIRUSES		
	Tomato Spotted Wilt	Cucumber Mosaic	Amaryllis Mosaic Virus
Symptoms	yellow spots [1]	mosaic	mosaic
Particle shape in electron microscope	spherical	spherical	flexuous rod
Insect transmission	thrips	aphids	not demonstrated
Mechanical transmission	yes	yes	yes
Seed transmission	not demonstrated	not demonstrated	reported (low percentage)

[1] Plus mosaic symptoms reported by Brants and van den Heuvel.

These characteristics suggest that the recommendations for control as described previously for both greenhouse and field-grown amaryllids (3) should be retained.

FUTURE RESEARCH

Virus-free propagations have been obtained from virus-infected plants as a result of heat therapy. Virus-infected plants are grown under continuous temperature of 97°-100° F in plant growth chambers with artificial lights or in greenhouses for 1 to 6 months depending on the ability of the plant to withstand high temperature. Under these conditions, virus may not move up into growing points as new growth develops. The meristems or growing points about 0-2 mm in length are aseptically removed and cultured on nutrient medium containing sugar, vitamins, growth regulators, and mineral elements and sometimes cocoanut milk. The meristems develop into plants which are then transplanted to soil. If meristems are not used, tip cuttings or buds are removed and propagated. Each meristematic bud or cutting propagation is then tested for virus in order to locate the small percentage that might come through free of virus.

Heat-treatment therapy has already been successfully used to free virus-infected cherries, chrysanthemums, carnations, strawberries, grapes, potatoes, and several other plants. Orchids have been freed of virus by meristem tip culture even without heat therapy.

Another application of meristem tip culture and of other forms of tissue culture is in vegetative propagation. Using these techniques one can increase valuable clones such as show orchids or difficult-to-propagate plants such as certain lily varieties.

As far as the author is aware, no one has reported the application of heat therapy techniques to produce virus-free plants or tissue culture to multiply valuable clones of amaryllids. The nearest approach was that of Dr. F. O. Holmes who used a specialized form of propagation and succeeded in developing virus-free plants from infected plants (4). He found some virus-free bulblets among those that were regenerated when stem pieces (free of leaves) were placed on sand under mist.

STIMULATING RESEARCH ON AMARYLLID VIRUSES

The host-virus combinations that have been investigated in heat-therapy projects have been economically important crops for the most

part. Apparently, amaryllids despite their beauty and the enthusiasm of amaryllid growers, are not economically important enough to stimulate research in this area if left to their own merits.

One method that has been used to stimulate research at state or private universities is the setting up of a graduate fellowship or assistantship or grant. Under this procedure the student receives credit for half-time on the project and support towards his education for the remaining half-time. Thus, he works full time on the project.

Other groups of growers such as orchid or rose growers have contributed money in the form of outright grants or assistantships to various institutions. These funds are car-marked for research in the crop of interest to the contributors.

It is my suggestion that amaryllid growers give some thought towards establishing a grant or assistantship at a university where heat-treatment facilities have been established. The grants or fellowship should be set up specifically to investigate the application of heat treatment and tissue culture techniques towards the production of virus-free amaryllid plants and the multiplication of clones that are difficult to propagate by standard vegetative means.

If the techniques can be successfully applied to amaryllids, many important clones could be rendered virus-free. This is especially important where the clone is universally infected—a situation which develops when a new hybrid seedling becomes virus-infected since all vegetative propagations of the clone would also be virus-infected.

The advantage of developing virus-free stocks is that the buyer of amaryllids would be assured at the time of purchase that the bulb is virus-free.

However, it should be understood by both the commercial supplier of bulbs and the buyer that virus-free clones could be re-infected particularly under field conditions. Virus-free plants that are derived from infected plants are not immune to re-infection. Consequently, commercial growers and buyers would still need to apply preventative control measures.

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JET FLIGHT TO SEE DAYLILIES IN CHICAGO—1967

W. Quinn Buck, *Chairman, Daylily Committee,*
The American Plant Life Society

A suggestion that the exceptionally good season of 1967 would make it an ideal time to visit Chicago, coupled with an invitation and an offer to be guided by Mr. Clarence J. Blocher, caused your chairman to decide to make the trip and see the gardens from which have come so many important daylilies in recent years.

After an exhilarating flight, our plane reached O'Hare Airport shortly before 4 P. M. on July 19, and Mr. Blocher met us and took us immediately to Mission Gardens in Techny, where we met Bro. Charles and some of his prominent visitors, including Dr. Robert A. Griesbach, Dr. George M. Darrow, Mrs. W. T. Hardy from Alabama, and others. Bro. Charles' tetraploid daylily seedlings were quite overwhelmingly wonderful, as we had been told that they would be. From here we hurried to Northbrook to have a brief look at the Orville W. Fay garden before it got too dark. We were pleased to get to meet Mr. and Mrs. Fay and their guests and to get to visit for a while after seeing the daylilies, which we found extremely exciting because of the wider color range included in the Fay tetraploids. When poor light drove us in, we had a chance to see Mr. Fay's collection of Dykes Medals and Stout Medals, and other treasured possessions.

At our motel in Wheaton we found that R. W. Munson, Jr., and his mother Mrs. Munson, Sr., and a young niece had arrived from Florida in the afternoon. More daylily talk was in order, until quite late.

On Thursday the whole party went first to Mission Gardens for a longer and better look at Bro. Charles' incredible melon seedlings, and we found many more new ones open. Steve Moldovan had arrived from Ohio and was in the field studying the seedlings. We went next to Mr. Fay's for a good look at his field in the hot, bright sun. The delightful thing to see again was the color range, as well as the unexpected colors to be gotten from crosses of 'Crestwood Lucy' and 'Gertrude Smith' with other clones.

The next stop was at the Nathan H. Rudolph garden in Aurora, where we found disappointingly little in bloom as yet. Then after seeing Mr. Blocher's gardens in Wheaton, we had a buffet luncheon in their home. We found Mrs. Blocher to be one of those very important wives who do much of the pollinating.

Our next stop was the too small back yard of Dr. Robert A. Griesbach in Park Ridge. The color spectrum of the tetraploid seedlings here was very wide, with impressive numbers of good reds, roses, and pinks; high quality yellows, golds, and melons were here also, but they were in the minority. Our visit had to be unsatisfactorily short as this garden warranted extended close study.

The last garden of the afternoon was the James E. Marsh garden in Chicago, famous for both iris and daylilies. The whole backyard was

a mass of bright color as all the various beds seemed to be in full bloom. Nearer the house the beds contained a large number of named clones and superbly grown clumps of the Marsh daylily introductions. Further back the beds contained seedlings, both diploid and tetraploid. We got to see other beds of seedlings being grown in the yards of good neighbors. Our regret here, too, was that we had had so little time in which to try to see so much.

Friday was spent mainly in close study of the plants at Mission Gardens, where many new seedlings were opening each day. In the afternoon there was another visit to the Fay garden, which needed rain.

Saturday morning was likewise spent taking notes on Bro. Charles' fine display. Among visitors at Mission Gardens were old acquaintances, Mr. George Gilmer from Virginia, and Mr. George P. Watts from New York. Mr. Watts was kind enough to take me along for a brief visit with the David F. Halls in Wilmette. It was a privilege to meet Mr. Hall and see his garden full of favorite varieties, many of which looked very different in a rain-watered garden in Illinois as compared with how they grow in irrigated California. 'Lady Inara', which has long been a favorite, was completely different in growth and stature, for example. 'May Hall', 'Wilmette', 'New Light', and many other fine clumps sparkled in this jewel garden among the old elms.

After our return to Mission Gardens a heavy thunderstorm ruined many of the flowers for the day. Mr. and Mrs. Blocher returned soon after from picking up their younger daughter at camp, and we spent much of the afternoon in the Blocher garden, ending with a final visit to Mr. Fay's and a last look at 'Beautiful Lady' and many others in his field. Sunday morning saw me at O'Hare Airport early and at home in Arcadia before noon.

In retrospect and from studying my notes, certain things stand out: Bro. Charles had many of the finest melon tetraploids so far developed, and some of his yellows were quite wonderful. One could not help wishing for more of other colors in his tetraploids, but it was especially interesting to be able to see several generations of great progress in the melons, with many of the finest 1967 seedlings coming from 'Heavenly Harp' ('Crestwood Ann' x 'Changing Times'). A few of these fine offspring would include T67-31; T67-2; T67-66, in beautiful scale; T67-51, a lovely greenish yellow of nice height and excellent branching. Other very attractive seedlings of the new crop included T67-50; T67-79, T67-43, a gold-edged melon; T67-53, a yellow; T67-47, a round, ruffled melon; T67-36, yellow; T67-38, an especially beautiful, round, deep melon; T67-60, very sunfast; T67-67, very sunfast pink melon of magnificent substance; T67-80, well branched, flaring ruffled yellow-melon with very pink midribs; T67-45, lovely pie-crust edged, flat, medium sized round melon; T67-37, an ardent apricot melon; T67-28, a lovely bright pink-and-green melon; T67-62, flat tangerine melon. Among Bro. Charles' diploids there were some nice creamy yellow such as 'Ascending Angel', to be released, and 'Crystal Sunshine'; or such

fine clones as 'Butter Curls', 'Little Rainbow', 'Cub Scout', and 'Toyland', this group being good miniatures. The truth is, however, that everything else was overshadowed by the tetraploids, no matter how good the diploids.

Fig. 2. Fay tetraploid daylily introductions: **left**, 'Kathleen Elsie Randall' (1965), and **right**, 'Lady Cynthia' (1966). Photos by Wallace D. Mulliken, M.D.

These two Fay tetraploid introductions are reported to be doing well in various sections of the country. In Arcadia the green-throated cream 'Kathleen Elsie Randall' may have been a bit more attractive than its sibling 'Lady Cynthia', but 'Lady Cynthia' set many more seed pods in 1967. These two of the very finest of the Fay introductions from the Northbrook garden which has been contributing some of our most important tetraploid daylily parents in recent years.

The Fay seedlings could not be studied so closely as Bro. Charles', but there were many delights among them, such as the 1967 releases, 'Mary Todd', which Mr. Fay considers his finest yellow to date, and 'Golden Surrey', which should be an interesting parent because of the fringed edges of its tepalsegs. A few of the good new yellows were T67-36, T67-12, T67-18, and T67-22. T67-6 was a nice creamy melon, and T67-19 was a fine small apricot melon. From previous seasons, FT65-10 and FT65-32 were fine yellow parents; T65-9, T65-41, and T65-55 were fine rose colors; FT65-23 was a somewhat narrow petaled rose that showed promising color for breeding. T66-13 was an especially beautiful salmon; T64-17 was a beautiful pink; FT66-38 was a good red, showing less sunburn than many of the seedlings in this difficult color.

Everywhere were evidences of Mr. Fay's meticulous care and strict evaluations. Among his diploid seedlings were many, such as 'Beautiful Lady' and many of her offspring, that were amazingly fine not to have been released at all, and they merited further attempts at polyploidizing them so that they could be used in widening Mr. Fay's breeding program.

The tetraploids of Dr. Griesbach will gain real attention when they are disseminated and can be seen.

The really great progress of the tetraploid daylily and a promise of further and snowballing progress were the main conclusions drawn from this first trip to Chicago.

IN MEMORIAM—MORRIS WALKER CLINT, 1903—1967

It is with profound sadness that I must report the death of Morris W. Clint to readers of PLANT LIFE, on April 8th, 1967. Morris was the husband of Katherine Lamberton Clint, the "other half" of the man-wife team of plant enthusiasts, lovingly known to our readers as "The Clints". Readers of PLANT LIFE will recall the many plant exploration trips that he and his wife, Kitty, shared in Mexico the past decade or more and which actually began in 1946 when Morris accompanied a friend on an orchid collecting trip. Morris was bitten by the "collecting bug" and returned home to infect Kitty. They never recovered. Their joint efforts resulted in a vast collection of plants that would do justice to a botanical garden, and visitors were usually stunned speechless upon seeing it for the first time. Kitty always seemed to be calmly amused by this reaction, but Morris seemed to capture the enthusiasm, seeming to be as delighted with it all as if it were he seeing it for the first time. Few visitors ever left the Clint estates empty handed. While Kitty continued conducting the tour, Morris would slip silently away, returning with samples of plants that the visitor might have been raving over a few minutes earlier.

Morris died at the age of 64, after several years of living with a circulatory problem that had greatly curtailed his garden activities, and had stopped any further ventures of plant explorations in Mexico. His survivors include his wife, Kitty; two sons, Morris, Jr. and Alan M. Clint, both of Brownsville; a daughter, Mrs. Marcia Wilson of Galveston; and seven grandchildren.

The APLS and the plant world in general have been left poorer with his passing, and he will be sorely missed, but those who knew and loved him will be richer for the experience.—*T. M. Howard*

IN MEMORIAM—CHARLOTTE MILLIKEN HOAK, 1874—1967

Miss Charlotte Milliken Hoak died Sept. 3, 1967, in Pasadena, Calif., after seeming to be recovering from pneumonia. She would have been 93 on Oct. 24, 1967. She was buried in Evergreen Cemetery in Mendocino on Sept. 8. Miss Hoak was born in Comptche in Mendocino County, Calif., and grew up there. After attending the University of California in San Francisco, where she received a Master's degree, she moved to Los Angeles, where she taught botany and horticulture in the public schools for over 50 years.

Miss Hoak was particularly interested in the *Amaryllidaceae* and bulbs of all kinds, and many of her botanical, gardening, and horticul-

tural writings dealt with them. She was a regular contributor to certain publications for many years, and she remained quite active in many areas of horticulture and garden club work up until just a few years ago. Miss Hoak is to be remembered as one of the real pioneers of California horticulture, along with Cecil Houdyshel, Carl Purdy, Theodore Paine, Kate Sessions, and a few others like them.—*W. Quinn Buck*

IN MEMORIAM—EDWARD FRANCIS AUTHEMENT, 1909—1967

Edward Francis Authement, our registrar of Amaryllis names, died suddenly on Sunday, July 20, 1967 at the age of 58 years. He had been hospitalized for quite some time and was apparently progressing nicely when he contracted pneumonia in mid-July which proved to be a load he was unable to cope with.

Fig. 3. Edward Francis Authement. 1909-1967

Mr. Authement was born in Cut Off, Louisiana, on March 12, 1909 where he attended local elementary schools and then attended La Rose High School in La Rose, Louisiana. Shortly after graduation, he moved to New Orleans and was employed by the Lone Star Cement Corporation in the capacity of diesel engineer.

On December 7, 1929 he married Miriam Gouget and three children were born of the marriage. He remained with the Lone Star Cement Corporation until December 1960, when he retired from that position. In October 1964 he accepted a position with the Sewerage and Water Board of New Orleans and held that position until his final illness caused his retirement therefrom in March 1967.

Fig. 4. Mr. Thomas I. Dickson, the American Vice Consul at Cochabamba, Bolivia, presenting the 1967 William Herbert Medal to Dr. Martin Cardenas on behalf of the American Plant Life Society, September 22, 1967. Photo *Los Tiempos,* Cochabamba, Bolivia.

For the past several years Mr. Authement had held the important office of Registrar of Amaryllis Names in the American Plant Life Society which he administered with efficiency and to the satisfaction of all the members. It was largely through his efforts that the "Catalog of Hybrid Amaryllis Cultivars, 1799-1963" was published in 1964. He reformed the exhibition schedule for the staging of Amaryllis shows.

He was a member of the Men's Amaryllis Club of New Orleans, having joined the organization shortly after its inception. He had held

various offices in the Club and was a member of the Board of Directors. He had served once as Show Chairman at the annual show, and also served for a number of years as Chairman of the Classification Committee. In connection with his position as Registrar of the American Plant Life Society, he had given numerous lectures and was always happy to oblige any organization that requested any information or services concerning Amaryllis. He also held membership in the Louisiana Society for Horticultural Research and had attended many of the annual meetings of that Society conducted by the late Ira S. Nelson.

Needless to say, he was held in high regard and esteem by all who knew him and his passing will mean a great loss to the Men's Amaryllis Club of New Orleans, and also to the officers and members of the American Plant Life Society.

Mr. Authement is survived by his wife, Mrs. Miriam Gouget Authement, two daughters, one son, two sisters, two brothers, and twelve grandchildren.—*James E. Mahan*

HERBERT MEDAL PRESENTATION TO DR. MARTIN CARDENAS

In a ceremony at the *Centro Boliviano Americano,* the American Vice Consul Mr. Thomas I. Dickson, presented the 1967 WILLIAM HERBERT MEDAL to Dr. Martin Cardenas, September 22, 1967, on behalf of the American Plant Life Society. The event was covered by the United States Information and Cultural Services, and the newspaper, *Los Tiempos,* of Cochabamba, Bolivia. The readers are referred to the 1967 issue of the Amaryllis Year Book for the autobiography of Dr. Martin Cardenas. See Fig. 4.

TRAUB—**AMARYLLIS NOTES,** continued from page 50.

Haemanthus magnificus forma *gumbletonii* (Bak.) Traub, *comb. nov.* Syn.—*Haemanthus magnificus* var. *gumbletonii* Bak. Amaryll. 66 1888.

Haemanthus magnificus forma *insignis* (Hook.) Traub, *comb. nov.* Syn.—*Haemanthus insignis* Hook. Bot. Mag. pl. 4745. 1875.

Haemanthus magnificus subsp. *superbus* (Bak.) Traub, *comb. nov.* Syn.—*Haemanthus magnificus* var. *superbus* Bak. Amaryll. 66. 1888.

Haemanthus puniceus subsp. *membranaceus* (Bak.) Traub, *comb. nov.* Syn.—*Haemanthus membranaceus* Bak. Amaryll. 66. 1888.

PLANT LIFE LIBRARY—continued from page 4.

TREES AND SHRUBS OF MILLS COLLEGE, by Baki Kasaphigil. Mills College Publ. Office, Oakland, Calif. 94613. 1967. Pp. 56. Illus.-map. Paper, $1.95. This book lists with brief descriptions, 449 species or varieties of trees and shrubs, grouped under 236 genera, and 93 families, growing on the 127 acre campus of Mills College. Highly recommended.

EVOLUTIONARY BIOLOGY, VOL. I., edited by Th. Dobzhansky, M. K. Hecht and Wm. C. Steere. Appleton-Century-Crofts, 440 Park Av. S., New York, N. Y. 10016. 1967. Pp. 444. Illus. $14.00. Since evolutionary biology represents a unifying principle in the life sciences, the subjects covered in this series draw on various disciplines. In the first volume the subjects include chemical evolution; evolution of brain achievements; variation and taxonomy of the early hominids; adaptive radiation and trends of evolution in higher plants; permanent heterozygosity; use of computers in studies of taxonomy and evolution; chemical systematics; and genetic loads in maize and other cross-fertilized plants and animals. This stimulating volume is required reading for all biologists.

THE PHYSIOLOGICAL CLOCK, 2nd revised edition, by Erwin Buenning. Springer-Verlag New York, 175 5th Av., New York, N. Y. 10010. 1967. Pp. viii; 168. Illus. paper, $3.00. This series is designed for the scientist and also for interested laymen with some basic understanding of the sciences. In the first volume, the biological measurement of time by unicellular organisms, higher plants and animals, including man, which utilize periods of approximately 24 hours, is covered. The author discusses the present state of our knowledge of the physiological nature of this clock and the many means by which organisms use this mechanism.

SUNSET WESTERN GARDEN BOOK, by the Editors of Sunset Magazine, and Sunset Books. New Edition. 1967. Lane Books, Willow Rd., at Middlefield Rd., Menlo Park, Calif. 94025. Pp. 448. Illus. $5.95. This new edition of an outstanding practical gardening manual for the West will be welcomed. It outlines the West's 24 climatic zones; indicates how to grow and select plants for particular situations, garden color, and special effects. A gardener's glossary, an encyclopedia of 5,000 plants, and a subject index complete the book. Highly recommended to all gardeners.

GARDENING IN CONTAINERS, by the Editors of Sunset Magazine and Sunset Books. Lane Books, Willow Rd., at Middlefield Rd., Menlo Park, Calif. 94025. 1967. Pp. 96. Illus. Paper, $1.95. This attractive and profusely illustrated manual for growing plants in containers will be welcomed by all gardeners. The subject matter is grouped under four headings: (a) what is container gardening, (b) how to garden in containers; (c) what plants thrive in containers and (d) where to put them and how to use them. Highly recommended to all gardeners.

ADVENTURES WITH FLOWERS, by Elizabeth T. Billington. Frederick Ware & Co., 101 5th Av., New York, N. Y. 10003. 1967. Pp. 60. Illus. $2.95. This attractive book introduces children to an appreciation of flowers by giving brief historical notes; points for recognition of flowers, flower families, and managing a flower show; and brief references to flower myths, legends, etc. Highly recommended as a gift book for children.

NEW TRENDS IN FLOWER ARRANGEMENTS, by Rae L. Goldson. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1966. Pp. 122. Illus. $4.95. This profusely illustrated text on the new way for making flower arrangements by an outstanding authority will be welcomed by all interested in this subject. The topics discussed include good design; texture; variety, function; abstraction; simplicity, etc. Highly recommended.

CREATIVITY IN FLOWER ARRANGEMENT, by Frances Bode. Hearthside Press, 381 Park Av. S., New York, N. Y. 10016. 1967. Pp. 160. Illus. $5.95. This book recognizes the trend which demands that the floral arrangement has to be a creative work of art. The topics discussed include craftsmanship; bases and stands; plant materials; accessories; the art of observation, and personal expression. This beautifully illustrated book is very highly recommended.

PLANT LIFE LIBRARY—continued on page 32.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1967 AMARYLLIS SHOWS

The Official Amaryllis Shows for the year 1967 began on April 8-9 with the New Orleans Men's Amaryllis Club Show. The Garden Circle Amaryllis Club of New Orleans Show was held on April 15-16. Then followed the Greater Houston Amaryllis Show on April 16; the Hattiesburg (Miss.) Amaryllis Show on April 22; the Corpus Christi (Tex.) Amaryllis Show on May 3; and the Southern California Amaryllis Show at Arcadia on May 22-23. Mrs. Pickard reports that the peak of bloom was reached too early for the scheduled date of the Houston Amaryllis Society Official show, but fine blooms won high honors in some of the local flower shows, and individual gardens of members were opened to the public where many fine specimens were displayed. No report was received from the Greater Gulf Amaryllis Show (Mobile, Ala.), and it is assumed that this show was not held in 1967.

MEN'S AMARYLLIS CLUB OF NEW ORLEANS OFFICAL SHOW, 1967

James E. Mahan, *Show Standards Chairman,*

3028 Palmyra Street, New Orleans, Louisiana 70119

The Edward Hynes School, 990 Harrison Avenue, was again the scene of the official Amaryllis Show held by the Men's Amaryllis Club of New Orleans, Inc., on April 8 and 9, 1967. The winter was considerably milder than those of the past several years which contributed, perhaps, towards the increased number of entries received for the show, 185 in all. An increase was also noted in the number of visitors to the show.

As in the previous year, the show schedule was formulated to accommodate the nine Amaryllis divisions set forth by the American Amaryllis Society and to satisfy their requirements for an official show. Members of the Men's Amaryllis Club of New Orleans, Inc., accounted for a total of 118 ribbons, comprised of 32 blue, 35 red, 32 yellow and 19 white. The following trophies were given: the Walter Latapie award for the best registered and named specimen to Edward Beckham; the Norman Clements award for the best unregistered and unnamed specimen to Edward Beckham; the James Mahan award for sweepstakes winner in named and registered section to Milo Virgin; the Reuter Seed Company award for sweepstakes winner in unregistered and unnamed section to Milo Virgin; the Alatex Construction Service, Inc., award for the best home-bred, developed and grown specimen to Milo Virgin; the Swetman Amaryllis Garden award for sweepstakes winner in the registered and named sections, potted and cut specimens, to Milo Virgin; the President's trophy for most blue ribbons won by a club member to

Milo Virgin; and a club trophy for the winner of the best single floret specimen to Edward Beckham (open to club members only). A section was initiated this year to receive plants bearing scapes with two florets, which falls under the arrangements category. Special ribbons were awarded where deserving.

Through the courtesy of Mr. Emile Malbrough a display of rex begonias was set up in the foyer of the school and was very well received by the visitors to the show, estimated to be between 400 and 500. The heartfelt thanks of the club go to Mr. Malbrough for his kindness.

Messrs. Norman Clements and W. J. Perrin acted as show chairman and co-chairman, respectively, and the club's thanks go to them and to all others participating in the show for helping to make it the great success that it was.

1967 OFFICIAL GARDEN CIRCLE AMARYLLIS CLUB SHOW

Mrs. A. J. Haydel, *Chairman,*

516 Gordon Ave., New Orleans, La. 70123

The sixteenth Official Amaryllis Show of the Garden Circle Amaryllis Club was held on Saturday and Sunday, April 15-16 with Mrs. A. J. Haydel as Chairman and Mrs. A. R. Oddo, President and Honorary Chairman.

This show was held in conjunction with the Federated Council of New Orleans Garden Clubs Show at the Club House of the picturesque Fair Grounds and attendance was very large. Early Spring weather, along with a late date, however, held down entries in the Amaryllis section of the show.

Trophy winners were Milo Virgin, Mrs. Edna Dopp and Mrs. W. J. Perrin. Preliminary Commendations were awarded to Mrs. A. J. Haydel and Milo Virgin.

GREATER HOUSTON OFFICIAL AMARYLLIS SHOW, 1967

Mrs. Sally Fox, *1527 Castle Court,*

Houston, Texas 77006

"Birds and bees" spelled out the theme of The Greater Houston Amaryllis Club's fifth official show, "Amaryllis Romance", in the Garden Center on Sunday, April 16, 1967. An overflow crowd showed interest in viewing over 100 various type amaryllids, with the point of interest being the table with the silver trophies, along with Awards of Merit, for the best of each division in the show. Winners were:

Mr. Kermit L. Warnasch, 4018 Drummond—Ludwig Challenge Cup for Royal Dutch. Mrs. Chas. H. Pease, 11059 Timberline—Greater Hous-

ton Amaryllis Club trophy for Helen Hull, a double amaryllis. Mrs. Clint R. Black, 1832 Forest Hill—Covered dish for Sparkling Gem, a miniature. The above three were also awarded Awards of Merit from the American Plant Life Society.

Mrs. John Ellett, 7531 Satsuma—Silver plate for Seminole Red, an American hybrid. Mr. Kermit L. Warnasch, 4018 Drummond—Wagner tray for Sweepstakes Award. Mr. Kermit L. Warnasch, 4018 Drummond—Silver shell for best Dutch Seedling he hybridized, plus Preliminary Commendation from American Plant Life Society. Mr. John Ellett, 7531 Satsuma—Silver plate for best in Invitational Class—Queen Superiora.

Fig. 5. Greater Houston Amaryllis Show, 1967. Mr. Kermit L. Warnasch, winner of Ludwig Challenge Cup with 'Royal Dutch' along with Award of Merit.

Mrs. Clint R. Black, winner of silver trophy for 'Sparkling Gem', a miniature along with Award of Merit.

Mrs. R. H. Haase was Staging Chairman, and was assisted by Mrs. Glen Melton. Their interpretation of the theme added a whimsical note to the show. The focal point was a large tree decorated with white birds, while the busy bees and colorful butterflies perched on the amaryllis blossoms in the garden in the center of the auditorium.

Mrs. Chas. H. Pease prepared the Educational Exhibit which was a very popular part of the show. She had containers on the table, each with the correct portions of ingredients to make a good loamy soil for planting the seeds. She explained they were heavy feeders and as soon as they were established in the pot to feed at regular intervals. Other containers, to which the seedlings had been transferred at various stages of growth showed the progress through approximately two to three years growth, when they were developed sufficiently to produce a bloom, adding that some seedlings bloom as early as eighteen months, while

others take longer. On the table was a specimen of a cross between a Dutch and a Mead, which the public could evaluate for beauty of the Dutch parent and sturdiness of the American parent. She also had a pure Dutch seedling as well as a species and a Miniature. All in all, the public was quite interested in producing some of these glamorous blossoms from seed and asked many pertinent questions.

Mrs. Sally Fox and Mrs. J. F. Denison, in charge of Entries, felt that it is very evident that members are striving for something new in amaryllis, as the register revealed there were 12 Dutch seedlings and 3 American seedlings competing for the silver trophy and Preliminary Commendation from the American Plant Life Society. Also, visitors were able to see amaryllis grown commercially in Africa and India in this show. Incidentally, the seedlings received unusually high grades from the judges, with the winner, Mr. Warnasch getting 97 points for his very large pink blend seedling. The second highest score of 96 was given to the darkest black-red blossom any of us have seen, which was hybridized by Mrs. R. A. Fawcett, who was awarded a Preliminary Commendation certificate.

Arrangements, showing the effectiveness of amaryllis, made by the members, were placed on pedestals on each side of the stage. These were not judged and merely added beauty to the show.

Mrs. W. S. Wheeler, 4506 Bellaire Blvd., is President of the Club, and assisted the Show Chairman, Mrs. Clint R. Black.

The members felt they gained many new amaryllis fans who will add these bold, colorful blossoms to their gardens. Our Invitational Class held twice as many specimens this year which is an indication that last year's show was successful in getting some new growers who wanted to compete for the silver trophy.

OFFICIAL HATTIESBURG AMARYLLIS SHOW, 1967

Mrs. Sam Forbert, *1910 Evergreen Lane, Hattiesburg, Miss. 39401*

The Hattiesburg Amaryllis Society held its seventh Annual Show April 22, 1967 in the beautiful and spacious home of Mrs. Lloyd Bond on Memorial Drive. The show which was open to the public from 3 p.m. to 8 p.m. attracted several hundred Amaryllis fans.

The exhibit was in the form of a Placement Show, the first of its kind for our Society. This type show, which is used extensively by garden clubs, proved most successful, as it afforded visitors to the show an opportunity to note the adaptability of the Amaryllis to the interior decor as well as to the garden. Near the entrance to the Bond home was a miniature cornice with draped curtains announcing the theme of the show, Curtain Call For Amaryllis. Both potted and cut scapes of many varieties of amaryllis were exhibited in the carport and on the patio. Blooms were classed according to division instead of country of origin as done in previous shows.

Seedlings exhibited were of the finest quality and won many Preliminary Commendations. The Amaryllis judged best in the show was

a seedling grown by Mrs. Gladys Coursey of Moss, Mississippi, a Member of the Society. Mrs. Leonard T. Brown was Sweepstakes Award winner with twenty three blue ribbons. Three Award of Merit Certificates were placed on her 'Red Coral', 'Flora Queen' and 'Picotee Red Lining'.

Mrs. Brown also won the Swetman silver tray, a Traveling Trophy, awarded by Swetmans' Amaryllis Nursery of Gautier, Mississippi. Door prizes were Dutch bulbs donated by Mr. Robert D. Goedert, bulb dealer of Jacksonville, Florida. Throughout the home there were many competitive artistic designs made by members of the Society. Each room had a theme, in keeping with the general show theme. Magnificent Obsession was the theme in the foyer. Mrs. Sam Forbert made the design here which won the Tri-Color Award. Mrs. J. O. Mayo won the Creativity Award. This design in the den of the home had as its theme, South Pacific.

Punch and cookies were served on the patio during the afternoon and evening.

Judges for the Horticulture Division of the show were: Dewey W. Hardy, Mr. & Mrs. Jeff Brown and Mrs. H. A. Allen of Mobile, Mrs. Mittie Young, Wilma H. Smith and Betty Hardy of Chickasaw, Alabama. Artistic Designs Judges were Mesdames Curtis Knight, Tom Mayfield and S. K. Ward of Taylorsville, Mississippi. Show Chairmen were Mrs. Charlie Bell and Mrs. R. A. Fowler.

1967 OFFICIAL CORPUS CHRISTI AMARYLLIS SHOW

Mrs. Carl C. Henny, *Vice-President*
P. O. Box 3054, Corpus Christi, Texas 78404

The Coastal Bend Amaryllis Society held it's annual Amaryllis Exhibit in conjunction with the Lola Forrester Flower show which was held in the Exposition Hall on April 15th and 16th, 1967. We are pleased to report that our weather conditions were much milder this year but rain is needed very badly in this area of Texas. However we were fortunate in having 67 entries of Amaryllis, mostly cut scapes, as our potted plants had bloomed ahead of time. In fact we had only four Pot Grown Registered Leopoldii Type Amaryllis in the Exhibit—namely, 'The Alamo', 'Indian Orange', 'American Express' and 'Picotee'.

Among the Registered garden grown Leopoldii Type Amaryllis were: (cut scapes) :—'American Express', 'Apple Blossom', 'Beautiful Lady', 'Cardinal', 'Daintiness', 'Goliath', 'Ludwig's Dazzler', 'Margaret Rose', 'Royal Dutch', 'Peppermint', 'Picotee Square Dance', and 'Spring Dream'. Among the Miniature Gracilis type were: 'Constant Comment' and 'Firefly'.

Mrs. Levi Materne received a blue ribbon on her entry of Picotee, pot grown, which scored 96 points. She was also given an American Plant Life Society Award of Merit for this specimen, and received a Preliminary Commendation Award on her entry of *Amaryllis belladonna* which scored 95 points. Mrs. Materne is a club member.

Mrs. Carl Henny received the "Ludwig Challenge Cup" for her entry of "garden grown" Leopoldii "Picotee Square Dance" cut scape which scored 95 points—a blue ribbon winner; and received a blue ribbon also on her 'Spring Dream' garden grown registered cut scape, which gave her the most blue ribbons in this section of the exhibit. Mrs. Henny also received the American Plant Life Society Award of Merit for her 'Picotee Square Dance' entry. Mrs. Henny is a club member.

Fig. 6. Corpus Christi Amaryllis Show, 1967. Mrs Carl C. Henny, winner of Ludwig Challenge Cup for her garden grown Leopoldii "Picotee Square Dance" cut scape which scored 95 points.

Mrs. Charles W. Sanders, a non-member, received the Award of Merit for the most outstanding entry within the Amaryllis Section, which was 'Apple Blossom', scoring 97 points; also a Special Trophy given by our Amaryllis Society to a non-member who receives the most blue ribbons in the registered and named amaryllis classes. She also received the American Plant Life Society Award of Merit for her cutscape—'Apple Blossom'.

Mr. Fred B. Jones, club member, received the American Plant Life Society Preliminary Commendation Award for his cut-scape entry in the Breeder's Class Seedling, which scored 95 points.

Thirty blue ribbons were awarded specimens entered. Three Accredited National Amaryllis Judges from San Antonio,—Mrs. E. T. Storey, Mrs. Robert E. Herold, and Mrs. R. H. Parkinson, judged our Exhibit.

1967 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

V. Roger Fesmire, *Show Chairman*

The third Amaryllis Show of the Southern California Hemerocallis and Amaryllis Society was held on May 22 and 23, 1967, at the Los Angeles State and County Arboretum, 301 N. Baldwin Ave., Arcadia, California. The most remarkable aspect of this show was the fact that we even had one, since the majority of our Amaryllis are grown outside. After an unusually cold spring, the week preceding the show was filled with wind, rain, hail, and cloudiness. The show was convincing proof that Amaryllis flowers can weather the storms and still look presentable.

Fig. 7. Southern California Amaryllis Show, 1967. A portion of the exhibits. Photo by Margie Sellers.

The Cecil Houdyshel Memorial Trophy, which is the sweepstake prize, was won by Mr. W. Quinn Buck of Arcadia, with the runner-up being Mrs. Flores Foster of Long Beach. Many hundreds of visitors viewed the exhibits during the two days, and by an overwhelming majority selected as the most outstanding exhibit a beautiful double Amaryllis raised from seed by Mr. J. Leonard Doran of Burbank. This was a pure white flower edged and spotted lightly with crimson, and it was the highlight of the show without any question, receiving the President's Award. An American Amaryllis Society Award of Merit was given to a hugh plant of 'Piccardy', having four magnificent blooms, which was grown by Mr. W. Quinn Buck in his greenhouse.

A table of miniature Amaryllis attracted much attention, making it apparent that the public is beginning to appreciate the smaller-flowered Amaryllis. One well-known nurseryman remarked that this table was "the dessert" of the show. One particularly beautiful plant in this miniature section was a hybrid between 'Tangerine' and *A. striata fulgida*, having a perfect Leopoldii type flower with a ruffled edge; it was raised from seed by Mrs. Bert Williams of South San Gabriel. Another table attracting much interest was an educational exhibit, showing how to cross pollinate the flowers and raise Amaryllis from seed.

Special Awards were given to Mrs. Bert Williams, Mr. Walter Horsey, and Mr. John A Moromarco for the large quantity of cut specimens which each entered in the show, thus contributing materially to its success. A Special Award was also given to Mr. E. A. Angell, who was a show visitor and exhibitor, in recognition of his more than thirty years of Amaryllis breeding in Southern California. Special mention should also be made of one of our members, Mrs. Eleanor McCown, who came more than 200 miles to enter her exhibits. Among her other entries, she prepared and entered three arrangements of Amaryllis, all of which received ribbons.

A Special Award was also given to the Chadwick Gardens of Redondo Beach for their non-competitive exhibits. In addition to some superb cut specimens and potted plants, they entered eight beautiful arrangements, demonstrating how Amaryllis blooms can be used by the florist in every type of floral design work. The bouquets to be carried by a bride and her attendants attracted particular attention. Our Society wishes to publicly express its appreciation to the Chadwicks for helping each year to make the show a success.

HOUSTON AMARYLLIS SOCIETY—HOUSTON, TEXAS

Mrs. A. C. Pickard

Nine years have now rolled into history since the day the Houston Amaryllis Society was organized. Yet, today there is greater enthusiasm, rapture and there are thrills without bounds as new hybrids are grown in the garden.

Fig. 8. Country garden of Dr. E. M. Yeats, Member of Houston Amaryllis Society, showing view of part of a thousand plants in bloom, 1967.

Every tint, shade and tone is reflected in modern day hybrids and every blend has a charm of its own to bring joy and excitement wherever the Amaryllis is known.

The gardens reached their peak much too early for the scheduled date of the official show. The membership felt we would not lower our standards by staging blooms that were not exhibition quality. However, nice cultivars won high honors in some few local flower shows.

Individual gardens of members were opened with many fine specimens. By re-visiting the gardens, we were able to see many prime blooms that were not open on previous visits. Amaryllis enthusiasts and garden lovers came to study and admire the colorful flowers and extensive experimenting under way.

So many fine Dutch Amaryllis seedlings of first quality bloomed this spring that it is difficult to select those which are worthy of being introduced. Some of the gardens contained many of the older Dutch hybrids still as lovely as when they were planted more than twenty years ago.

The most important feature was the effort to encourage the *garden growing* of Amaryllis and to increase garden programs as well as garden judging. The effectiveness and value of growing quality Amaryllis in this manner also helps to raise the floricultural standards of the community.

A bird's eye view of the country garden of one Houston Amaryllis Society member, Dr. E. M. Yeats, boasts of more than one thousand blooms and in a small corner of the city garden of Mrs. A. C. Pickard, several hundred fat buds nestled in deep shining foliage, soon to put on a show all their own.

We hope many of you will plan to be our guests in the coming years when we again try to reach the peak of perfection with a wealth of material to choose from. These beautiful blossoms seem to whisper. "God's presence is near".

BASIC INFORMATION FOR THE AMARYLLIS SHOW SCHEDULE

Mrs. A. C. Pickard,
Official Amaryllis Judging Instructor

It is appropriate to outline a pattern of organization and method of procedure that may be helpful to all local committees in conducting Amaryllis Shows in the future. The actual schedule should have the approval of the American Amaryllis Society itself and should not be changed from year to year in any way except as certain features related to the local situation might be added or deleted.

The following material is meant to be suggestive of most of the details to which show officials and exhibitors must give attention.

CULTURAL PERFECTION, CONDITION, GROOMING AND SUITABLE CONTAINERS

The beauty of horticulture should depend upon cultural perfection and natural appearance at the time of judging. Foliage, if present, should be clean and fresh, but not artificially polished. Spent florets and scapes should have been carefully removed. Any necessary staking should be done as inconspicuously as possible and related in color. No stakes should protrude above the florets.

Containers may be either clay pots or wooden planters, although clay pots are preferred in relation to the good culture of the plant. Clashing colors, such as brilliant glazed pots, shiny foil, etc. detract from the plants' color and should be eliminated. The light reflection of shiny, unsuitable material is also a great hindrance in photography Cultural malpractice is often concealed in a covered pot and reflected in a plant's appearance. Suitable, clean containers are allowed 10-15% of the cultural perfection points.

The size of containers should be proportioned to plant size and should not look overpotted so as to seem lost in the container.

Containers for cut specimens should be provided by Flower Show Committee and be of uniform size.

Artistic Divisions Classes, although not compulsory, add to the appearance of the show. The situation will vary greatly from place to place. Remember—the judging of these classes requires a different panel of judges.

EDITOR'S MAIL BAG

The new address of Sydney Percy-Lancaster as of January 1, 1967, is *Indian Botanic Garden, P. O. Botanic Garden, Sibpur, Howrah, near Calcutta, India.* He writes, "I had already spent 61 years there before I went to the National Botanic Garden Lucknow, so will be among old friends."

Dr. W. W. Zorbach, formerly of Kensington, Maryland, writes under date of July 25, 1967, "I dug up all my bulbs in June and packed them in vermiculite; they were shipped with our furniture and arrived intact. I have been struggling with a suitable bed for them, but have been hampered lately by heavy rains, so they are not planted yet. Hopefully, in about a week I can get to the job before they expend *all* their energy in growth. . . . My new address is *1109 Walnut Drive, New Iberia, Louisiana 70560.*"

The January 11, 1967 issue of Farmer's Weekly, Bloemfontein, South Africa, features a color plate of Mr. Leon Boshoff-Mostert's new Hybrid *Amaryllis* clone which he plans to use in his breeding operations. The issue also contains a tribute to Mr. Boshoff-Mostert on receiving the Herbert Medal, and an article about his hybrid *Amaryllis* which is profusely illustrated in color. The same issue also includes a

color plate of *Haemanthus brevifolius* (=*Haemanthus carneus* (Ker.-Gawl.) Salisb.), and *Cyrtanthus sanguineus.*

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1967 Amaryllis Year Book (pages 31 and 32), the following numbered Amaryllis Judges Certificates have been issued by the American Amaryllis Society:

167. Mr. E. M. Yeats, 7911 Baltimore Av., Houston, Tex. 77012 (Horticulture only)

168. Mr. V. Roger Fesmire, 16938 Elgar Av., Terrance, Calif. 90504 (Horticulture only)

169. Mrs. Kenneth B. (Polly) Anderson, 4810 Palm Drive, La Canada, Calif. 91011 (Horticulture only)

CATALOGS RECEIVED

KLEINSKUUR, 1966-67, 28-PAGE CATALOG, with 4 color plates, and other illustrations, featuring Hybrid **Amaryllis, Hemerocallis,** Tall Bearded **Iris,** and other **Iris;** and some miscellaneous plants and bulbs. Address: Leon & Frieda Boshoff-Mostert, Kleinskuur, P. O. Box 84, Balfour, Transvaal, Republic of South Africa.

UNIVERSITY HILLS NURSERY, 1967-68 SEASON CATALOG, Claude W. Davis, Proprietor, 470 Delgado Drive, Baton Rouge, Louisiana 70808, 23 pages listing **Amaryllis, Iris, Hemerocallis,** Crinums, Crinodonnas, **Zephyranthes, Kniphofia,** native trees and shrubs. Future catalogs will be ready for distribution about August 1 of each year, but will no longer be sent to the permanent mailing list. A free copy will be sent on request.

HYBRID AMARYLLIS CATALOG, Aug 1967. Robert D. Goedert, P. O. Box 6534, Jacksonville, Fla. 32205. (A) Dutch Strain Amaryllis seed; special crosses; (B) South African grown Hybrid Amaryllis; (C) Dutch Grown Hybrid Amaryllis—Van Meeuwen Strain; and (D) Imported Dutch grown hybrid Amaryllis—Super-Brand.

LUDWIG AMARYLLIS (17th EDITION), Ludwig & Co. N.V., P. O. Box 18, Hillegom, Holland. (received August 21, 1967); 32 pages and cover, profusely illustrated in color; listing the current offerings of hybrid named registered Amaryllis clones, and **Cyrtanthus purpureus** (syn.- **Vallota speciosa**).

AMARYLLIS LECTURES & JUDGES CERTIFICATE SCHOOLS

Local Amaryllis Clubs and Societies interested in having lectures on Amaryllis Culture, and schools for the Amaryllis Judges Certificate, should communicate with Mrs. A. C. Pickard, 1702 North Blvd., Houston, Texas 77006.

PLANT LIFE LIBRARY—continued from page 20.

ADVANCES IN MORPHOGENESIS, Vol. 6, edited by M. Abercrombie and Jean Brachet. Academic Press, 111 5th Av., New York, N. Y. 10003. 1967. Pp. 331. Illus. $15.00. This 6th volume in the series contains papers by seven outstanding authorities, including the biology of teratomas, the development of patterns in the integument of insects; the control of embryonic hemoglobin synthesis; heteroblastic development in vascular plants; ultrastructure of the nucleus of the developing amphibian egg; artificial parthenogenesis; polyploidy; gynogenesis and androgenesis in silkworms; and developments in sexual organogenesis. Highly recommended.

PHAGE AND THE ORIGINS OF MOLECULAR BIOLOGY, edited by John Cairns, G. S. Stent and J. D. Watson. Cold Spring Harbor Laboratory of Quantative Biology, Cold Spring Harbor, L. I., New York 11724. 1966. Pp. 340. Illus. $12.50. This stimulating book is concerned with the history of creative thinking and practice as exemplified in the recent development of molecular biology. After a delightful preface on the origins of molecular biology, the papers are grouped under (a) the phage renaissance; (b) phage genetics; (c) bacterial genetics; (d) DNA, and (e) ramifications of molecular biology. This is required reading for all biologists. Highly recommended.

PLANT PHYSIOLOGY, by Henrik Lundegardh, transl. by F. M. Irvine and W. O. James. American Elsevier Publ. Co., 52 Vanderbilt Av., New York, N. Y. 10017. 1966. Pp. 549. Illus. $37.50. This stimulating book incorporates the matured views of Prof. Lundegardh. The ten chapters deal with the cell and protoplasm; development of the cell; photosynthesis and the formation of carbohydrates; respiration; fermentation, and enzyme chemistry; plant nutrition; water balance; and plant growth and movement. Highly recommended.

ROCKY MOUNTAIN FLORA, 3rd Edition, by William A. Weber. University of Colorado Press, Regent Hall, Boulder, Colo. 80304. 1967. Pp. 437. Illus. $9.40. This book specifically covers the central Colorado region, but it may be used throughout Wyoming, Colorado, and New Mexico, to good advantage because of a general similarity of the floras of the three states. Over 1,500 kinds of plants are keyed and classified, and there are 340 illustrations. The keys have been tested over a period of years, and the plant families are arranged alphabetically for the convenience of the non-professional users. Highly recommended.

PHYLOGENY AND FORM IN THE PLANT KINGDOM, by Howard J. Dittmer. D. Van Nostrand Co., 120 Alexander St., Princeton, N. J. 1964. Pp. xiii; 642. Illus. This book provides a survey of the Plant Kingdom with special reference to the descriptions of the structure, reproductive processes and phylogenetic relationships of the principal plant groups—bacteria, algae, higher green plants and fungi. The text is adequately illustrated, and the subject matter is sufficient for a full year's course. This attractive text is highly recommended.

CHEMOTAXONOMIE DER PFLANZEN, VOL. 4, DICOTYLENONEAE: DAPHNIPHYLLACEAE—LYTHRACEAE, by R. Hegnauer. Birkhaeuser Verlag, 4000 Basel 10, Switzerland. 1966. Pp. 551. Illus. sFr. 100. In the 1966 Plant Life, volume 3 of this series was reviewed, ending with Dicotyledones—*Cryillaceae*. In volume 4, the chemical compounds reported for the families *Daphniphyllaceae* to *Lythraceae*, are listed and discussed. The addenda and an index complete the volume. This valuable reference work belongs in the library of every taxonomist.

GERMANIUM, by V. I. Davydov, P. Rudenko and L. V. Kovtun. Transl. by Adam Peiperl. Gordon & Breach, Publ., 150 5th Av., New York, N. Y. 10011. 1967. Pp. 316. Illus. $18.00. After detailing the importance and uses of germanium in technology, the authors consider the raw material sources and methods of production of germanium, and the physiochemical properties of germanium and its compounds. The radioactive isotopes of germanium are discussed in an addendum. Highly recommended.

PLANT LIFE LIBRARY—continued on page 62.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

NOTES ON **AMARYLLIS** SPECIES 1967

JOSEPH C. SMITH, *M. D.*

8939 La Mesa Blvd., La Mesa, Calif. 92041

Everyone loves a surprise and that is just what you are in for when you are growing a new species of *Amaryllis* for the first time. Thanks to our good friend D. C. G. Ruppel of Mendoza, Argentina, who supplied the bulbs, I have once again had this very pleasant experience.

Fig. 9. **Amaryllis** sp. "Red Cochuna", collected by Dr. C. G. Ruppel on the Cochuna River near Conception, Argentina, October 1966.

In October of 1966 Dr. Ruppel sent bulbs of what he thought might be a new species of *Amaryllis* that he had collected on the Cochuna river near Conception, Argentina. The temporary name of this species is "Red Cochuna". When these bulbs were planted they quickly sent up slender flower scapes that bore two to four flowers of an orange red color similar to that seen in some of the deeper toned striatas. The

form of the flowers resembled that of *A. aglaiae* so much that my first thought was that this was possibly a red form of *A. aglaiae*. However, on closer observation of the stigma it was easy to see that "Red Cochuna" (Fig. 9) belongs with the subgenus *Lais* and is therefore separated from *A. aglaiae*. The foliage also closely resembles that of *A. aglaiae* by being about an inch in width for most of its length and by having an obtuse, rounded tip. The bulbs are different; being more globose. None of the species has such beautifully shaped bulbs as *A. aglaiae* with its perfect oval shape.

The new species, "Red Cochuna", blooms early in the season with or without foliage but with plenty of foliage on younger non-flowering bulbs in the same clump. A very distinctive characteristic of this species is its rapid growth in spring and early summer with complete flagging of its foliage in mid summer and reappearance in fall; lasting until cut down by winter. The flowers come with the early spring growth and do not repeat with the fall foliage. This characteristic distinguishes it from all other *Amaryllis* species known in this part of Argentina.

It is suggested, should this prove to be an entirely new species of *Amaryllis* that it be named for Dr. Ruppel who discovered it. However, Dr. Ruppel might do well to wait before having his name applied to a species until another of his discoveries can be identified. This one (*see* Fig. 11) is a beautiful brownish-red *aulica* type from Brazil. It has a green center and white petal margin and is pretty enough to do honor to anyone's name.

Dr. Ruppel has described so many interesting amaryllids which he has collected in his travels about South America that one can hardly keep from being greedy when requesting bulbs from him. To mention a few—there is the fertile form of *Amaryllis ambigua*, the greenish-yellow long-trumpeted fragrant species, the possible *A. petiolata* from Uruguay, and *A. parodii*, to say nothing about the many *Rhodophiala, Habranthus, Zephranthes*, etc., species he has collected.

It is certainly hoped that Dr. Ruppel will have many more years of good health in his now retired life so that he may continue his travels and collections of amaryllids. It is understood that certain groups in this country are contributing to the financial success of his collecting trips. He is certainly a man who knows amaryllids and is in a position to do much toward the advancement of knowledge of these most interesting plants. He deserves all our support.

THE RHODOPHIALAS ARE COMING!

Paul H. Williams, Jr., *6128 Sundown Drive, Fort Worth, Texas 76114*

For several years I have been amazed that most of the known species of the family *Amaryllidaceae*, until very recently, were first discovered and described during the 18th and 19th centuries and relatively nothing in between. Consider the difficulties and expense involved during those periods as compared to our own times. And most of the species

have to be rediscovered to be enjoyed by us! All that lost time to be made up! Without the original descriptions we wouldn't even know of the existence of large sections of the family. Are they really that rare in their native lands or is it that most people just don't care?

Fig. 10. Amaryllid imported as **Rhodophiala rosea: left,** potted plant photographed at 3 ft. by Paul H. Williams, Jr. at Fort Worth, Texas. Photo by Dr. C. G. Ruppel. **right,** the same from a color slide taken by Dr. C. G. Ruppel, Mendoza, Argentina.

My addiction to the family *Amaryllidaceae* became certain in the late 1950s and since that time I have done my best to make up for lost time and prior ignorance. For instance, in the Tribe *Zephyrantheae*, which, incidentally, seems to fit into the variable climates of Texas, there is the genus *Rhodophiala* which contains 31 species native to Chile, Bolivia, Argentina, and Uruguay. In Fort Worth you see the one called "Ox-blood Lily". Fairly common, thriving, and beautiful in the fall. Why not any others? I want to see all 31 of them! So I went to Argentina—by mail, of course! And there I found Santa Claus! He really exists! In the person of Dr. C. Gomez Ruppel. Thanks to the generous efforts of that worthy addict we now have, to my knowledge, in various stages of development, 14 species of *Rhodophiala*. Only one has bloomed so I will tell only about it.

During the first week of November 1966 I received a parcel of amaryllid bulbs from Dr. Ruppel. Among these treasures was a packet labeled "A. bifida Sehnem" which contained two marble sized, marble shaped bulbs and a litter of bulblets. The two bulbs were planted in a 4-inch bulb pan and watched for developments—and watched—and watched. In January 1967 curiosity overcame caution and one was eased out of the soil. No roots were evident but the ring of bulblets

formed reminded one of a setting hen and chickens. Everything was carefully replaced.

One day in late January, a bud was spotted nosing out of one of the bulbs so water was immediately applied to help the delivery. During the time the scape was emerging, Dr. Ruppel's letter was referred to again for possible enlightenment. His description read: "Father Aloysio Sehnem, a good friend and botanist from Sao Paulo, South Brazil, gave me this very nice bright red, miniature of the subgenus *Chilanthe*. Evergreen in Mendoza. Flowers in late spring. Rich black, fibrous soil."

When the scape had reached a length of 16 cm., the single bud opened to a beautiful brilliant red. (Fig. 10) The bloom was selfed with crossed fingers, but it did no good. The ovary didn't even pretend to swell and a later letter from Dr. Ruppel confirmed what I had dreaded—it was self-sterile. In spite of this, it should become popular, as offsets form about as fast as those of *Nordoscordum inodorum*.

Fig. 11. Brownish-red **aulica** type **Amaryllis** discovered by Dr. C. G. Ruppel in Brasil. Photo by Dr. Ruppel.

Careful measurements were taken and the key to genus *Rhodophiala* in 1956 PLANT LIFE was consulted. Through the process of elimination, I arrived at *Rhodophiala rosea* (Sweet) Traub, which, in turn, led me to *Amaryllis barlowii* in AMARYLLIDACEAE: TRIBE AMARYLLEAE for the description. Yes, it checked! In my lay opinion we now have the long lost species first introduced in England in 1831 and now known as *Rhodophiala rosea*. A bulb has been forwarded to Dr. Traub for verification which should allow us to scratch off another member from the missing list.

Of the remaining 13 species of *Rhodophiala* in my possession some may bloom this year (1967) and will be reported on later, but most were received as seed and only time will tell.

Fig. 11 shows a beautiful brownish-red *aulica* type Amaryllis discovered by Dr. C. G. Ruppel in Brasil.

References: page 72, 1956 PLANT LIFE; page 122, HERBERTIA 1938; page 35, HERBERTIA 1934, and page 97, Amaryllidaceae: Tribe Amarylleae, 1949.

AMARYLLIS AULICA KER-GAWL.

Sam Caldwell

The following is a report on SA 63-10 received from Robt. D. Goedert, Dec. 15, 1963 who imported the bulbs from South America. The bulb flowered in December 1966 when the fine flower scape in Fig. 12 was photographed. The species was identified by Dr. Hamilton P. Traub as *Amaryllis aulica* Ker-Gawl.

Dec. 15, 1963—4 very dry bulbs, 7/8″ to 1″ in diameter, pear-shaped without roots, all planted together in a 7″ azalea pot. Interim note: Bulbs grew strongly from the first. New leaves start in late summer or fall, grow through winter in cool greenhouse and tend to die away before hottest summer comes again. Foliage appearance and growth habits are so exactly like those of *A. aulica* var. *stenopetala* that I felt sure that is what it would turn out to be. Bulbs have remained for 3 years in the same pot with same soil, in perfect health and vigor, but they now completely fill the pot and are crowding each other.

Dec. 1, 1966—One bulb, now 2 5/8″ in diameter, has a fine flowering scape (Fig. 12). Another bulb, 2 5/16″ in diameter, has a scape with buds nearly ready to open. A third bulb is considerably larger than these, with larger and longer leaves (3 3/8″ bulb diameter) and may be different; it has never bloomed. The fourth bulb is smaller and has not bloomed, either.

Scape is 18″ tall; pedicels, 1 7/8″. It has 2 flowers, each 6″ across, 6 1/2″ top to bottom, and approximately 3 3/4″ deep. Upper inner segments 1 3/4″ wide; lower, outer segments 7/8″ wide. Stamens shorter than segments; pistil about as long as segments. Stigma split deeply in 3 parts. Segments are a strong red color with deeper red veining blending into a deeper reddish maroon shading toward the throat, though a part of the deeper appearance is due to a surface sheen that is quite attractive. Base of all segments is strong green, inside and out, giving the flower a distinctive green throat. Dec. 12, 1966—The second budded scape, mentioned above, has now bloomed. Though undoubtedly the same species, it is not absolutely identical to the first. Segments are not quite as wide. Basic coloring is the same, but the green throat is not as deep as in the first flowers; also, on each segment a narrow, irregular line of the red-maroon coloring near the base runs along the middle of the segment right through the green area, back to the very base.

I consider the second individual a little inferior to the first, though both are beautiful amaryllis, the distinctive red-and-green pattern giving a sort of "Christmasy" effect. This, apparently, is the normal blooming season for this species. Its vigor and health and ease of growth, together

Fig. 12. **Amaryllis aulica** Ker-Gawl., imported by Mr. Robert D. Goedert (SA 63-10), from South America in 1966. Plant grown and photographed by Mr. Sam Caldwell, Nashville, Tenn.

with the attractive bloom, make it certainly one of the best of the unidentified species that I have flowered. I've marked the bulb with the better bloom and will try to build up a stock of it. Would this be simply the typical *A. aulica?* Later identified by Dr. Traub as *Amaryllis aulica* Ker-Gawl. with relatively wider tepalsegs.

CRINUM SCHMIDTII REGEL

L. S. Hannibal, *4008 Villa Court,*

Fair Oaks, Calif. 95628

During the past ten years the writer has picked up a number of *Crinum moorei* variants and hybrids. One outstanding white form passes under the name of 'Herald' or 'Drysdale White'. The identity became puzzling when it was found that a bulb from Saint Catherine Island off the coast of Brazil, and another from Adelaide, Australia

Fig. 13. Crinum schmidtii Regel as grown by Mr. L. S. Hannibal, Fair Oaks, Calif.

were similar. William Drysdale then reported that the bulb he was growing came from Mrs. E. M. Foster's garden, an early member of the American Amaryllis Society.

Two conditions were apparent, first that source of the bulb was undoubtedly from van Tubergen, and second that no hybrid would produce such uniformity in seedlings. Quite a search was instigated but *C. schmidtii* was excluded for some time since another *C. moorei* clone has been passing for *schmidtii* in California for more than 35 years. However, an examination of the Gartenflora description of *C. schmidtii* clarified the confusion. *Crinum schmidtii* Regel (syn.-*C. moorei* var. *schmidtii*) is significantly more robust than the common *C. moorei* with broader, sturdier foliage. The blossoms open widely and have a great deal more substance. These are snow white, no pigmentation is evident even in the filaments. The identifying factor is the bified stigmas with branches near 2 mm. long; a unique feature in *Crinum* and one of the causes justifying a separate species status.

It is to be noted that *C. schmidtii* is very slow growing, produces few offsets and does not seed freely. The bulb is better adapted to the humid Gulf climate than inland California. *C. powelli album* and 'White Stranger' are *C. schmidtii* seedlings which suggests it has good breeding characteristics.

AMARYLLID GENERA AND SPECIES

Harold N. Moldenke

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Allium Scaposum Benth. in Pl. Hartweg. 26. 1840. Leaves radical, linear-terete, long-sheathed at the base, shorter than the terete scape; spathe broad, bifid, shorter than the pedicels; umbel many-flowered, loose when capsule-bearing; perigonium [segments —omitted probably by error] lanceolate, acuminate, rather acute; stamens subequaling the perigonium; filaments subulate, dilated at the base. — Scape 12 or more inches long, slender; pedicels an inch long; perigonium segments 6 mm. long, white when dry, red-keeled in the center. Along small streams, Aguas Calientes.

Callithauma viridiflorum Herb. in Amaryll. 225. 1837. Bulb 6 inches long, cylindric; leaves about $\frac{3}{4}$ [inch] wide, green, almost flat; scape green, double; spathe marcescently deciduous; peduncles short, subequal; ovary oblong, trigonous, about $\frac{3}{4}$ inch [long]; [perianth-] tube $1\frac{3}{4}$ to $1\frac{7}{8}$ inches [long], $\frac{1}{4}$ inch wide above, pale-green, the limb green, about an inch [long], the corona equal, paler, 12-lobed along the margin; filaments inserted in the upper region of the corona, connivet, included; anthers versatile; style shorter than the corona; stigma obtuse. C. angustifolium [has] the leaves half as wide, the [perianth-] limb surpassing the corona by $\frac{1}{4}$ inch, the style exceeding the perianth and the stigma dilated and 3-lobed.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition, of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIIth International Horticultural Congress in 1966 the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for *Amaryllidaceae* cultivars excepting *Narcissus* and *Hemerocallis*.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis*, *Lycoris*, *Brunsvigia*, *Clivia*, *Crinum*, *Hymenocallis*, and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

Registered by Ludwig & Co., Hillegom, Holland

'Bellina' (Lud.-1967) R; A-856, D-5A; U-4 fld.; 22″-24″ h; fls. 9″-10″ diam.: Solid Porcelain Rose (RHS 620/1), slightly deeper shade in throat; spr.

'Courtesy' (Lud.-1967), R; A-857, D-5A; U-4 fld.; 22″-24″ h; fls. 8″-9″ diam; Apple green throat shading into white stripes contrasted with white Neyron Rose (RHS 623) changing into lighter rosy salmon and rosy salmon white towards ends of petals; spr.

'Eastern Dream' (Lud.-1967), R; A-858, D-5A; U-3 or 4 fld.; 26″-28″ h; fls. 8½″-9″ diam.: Carmine Rose (RHS 621/1); with darker throat (RHS 621); spr.

'Fairyland' (Lud.-1967), R; A-859; D-5A; U-4 fld.; 25″-27″ h; fls. 8″-9″ diam.; solid Neyron Rose (RHS 623), accentuated in throat.

'Fantastica' (Lud.-1967), R; A-860; D-5A; U-4 fld.; 22″-24″ h; fls. 9″-10″ diam.; Mandarin Red (RHS 17) with a white star springing from an apple green throat ending in white edge contouring each petal.

'Ludwig's Striped' (Lud.-1967), R; A-861; D-5A; U-4 fld.; 26″-28″ h; fls. 8″-10″ diam.: Poppy Red (RHS 16) edged in white similar to picotee red edging with distinct white line (abt. ½″) from throat fading toward tip of petal.

'Ludwig's Red' (Lud.-1967), R; A-862; D-5A; U-4 fld.; 22″-24″ h; fls. 7″-8″ diam.: Glossy Blood Red (RHS 820), darker throat, flowers perfectly round.

'Red Heron' (Lud.-1967), R; A-863; D-5A; U-4 fld.; 35″-40″ h; fls. 8″-9″ diam.; Capsicum Red (RHS 715) with darker throat.

'Carina' (Lud.-1967), R; A-864, D-8; U-4 to 5 fld.; 16″-18″ h; fls. 4″-5″ diam.; Mandarin Red (RHS 17/17/1); with darker throat with suggestion of green.

'Pretty Pal' (Lud.-1967), R; A-865; D-8; U-4 fld.; 24″-26″ h; fls. 4″-5″ diam.; Capsicum Red (RHS 715), with white striped throat.

'Rubina' (Lud.-1967), R; A-866; D-8; U-4 to 5 fld.; 16″-18″ h; fls. 4″ diam.; dark blood red with darker throat (RHS 820).

'Table Decoration' (Lud.-1967), R; A-867; D-8; U-4 to 5 fld.; 22″-24″ h; fls. 5″-6″ diam.; Mandarin red (RHS 17) with star in throat.

Registered by Mr. Alek Korsakoff, Jacksonville, Florida.

'Green Senorita' (Kors.1967), R; A-855; D-8; U-2 fld.; 55 cm. h; fls. 11 cm. diam.; Chartreuse green (RHS 66 3/1), pea green in throat; spr. - win.; semi-ev. Parentage: A. Striata x A. Evansiae.

Registered by Mr. Frederick B. Schmitz, Port Sulphur, Louisiana.

'Edward Authement' (Schm.-1967), R; A-868; D-7; U-3-4 fld.; 18″ h; fls. 6″ diam.; Cardinal red (RHS 822/1 to 822); spr.

SUGGESTIONS ON STAGING AMARYLLIS SHOWS

James E. Mahan

The keynote of any successful amaryllis show is advance planning, not only generalized planning but planning well in advance, down to the

last and most minute detail. Any club contemplating staging an amaryllis show should appoint a forceful show chairman, one who has the ability to work with others and inspire them to get their jobs done with dispatch. The chairman should pick his co-chairman immediately so that he will have help with the many details that inevitably crop up. Next the various committees should be appointed, such as registration, classification, placement, publicity, judges, clerks, hospitality and dismantling.

The show date should be decided at the earliest possible moment. It should be set to coincide with the time that the amaryllis are at the height of their bloom. This can be difficult as many factors enter into this decision such as the weather throughout the winter and the ensuing early spring or a conflict with other shows previously announced. It can be seen that by announcing the date of the show as early as possible other garden clubs will respect such a choice and not schedule their shows on that date. In connection with the date, the place where the show will be held also has to be decided. Consideration should be given to the accessibility of the site chosen through public transportation and parking facilities for the visitors who come in their own automobiles. Next, the hours when the show will be open to the public should be decided and once these things have been resolved all the information should be given to the publicity committee so work can be begun on calling to the attention of the public that a show is going to be held. Of great help to the publicity committee are such media as newspapers (garden editors in particular), radio, transportation company bulletins, national gardening magazines (which demand that notices be sent months in advance in order to be published) and television stations. Do not overlook the television stations, especially when an educational station is located in your area. Usually they are more than willing to cooperate and perhaps you can even get your county agent to give you some help in arranging a presentation over a television station. Be sure to include in your publicity an announcement whether the show is open to competition by the public or is a closed show and whether there is any admission charge. The final duty of the publicity committee is the preparation of a report of the results of the judging in the show for publication by the newspapers along with pictures of the top prize winners.

A show schedule should be formulated by the show chairman as soon as possible and distributed to the club members and, in particular, to the various other committee members. A certain degree of latitude is allowed in setting up a schedule but care must be exercised that it meets all the requirements of an official show. In my estimation it is certainly easier and more convenient to set up a schedule according to whether registered and named or not and then subdivided into the nine divisions defined by the American Amaryllis Society rather than segregate the entires according to country of origin. It is becoming increasingly difficult to define what a "Dutch" hybrid is or what and "American" hybrid is and the former method obviates this difficulty.

Then, too, if using the latter classifications we run into the problem of what to do with the South African hybrids, or the Indian Hybrids, etc. Due thought should be given to the inclusion in the schedule of a special amateur breeder's competition in order to encourage hybridization and development by the local amateur grower.

Next in line will be arranging well in advance for the various trophies that will be awarded. Outside sponsors usually are willing to furnish some of the trophies with the club furnishing the balance that has been determined to be necessary. Arrange for the engraving, the ribbons, entry cards and programs so that when the morning of the show arrives everything is on hand at the site of the show. Entry cards can be given to all members before the show so that they can be filled out in advance thus speeding up operations on the morning entries are received. Have sufficient on hand for all anticipated entries from the public. Enough programs should be printed for each visitor to have one.

It will be necessary to make arrangements to have a sufficient number of accredited amaryllis judges on hand for judging the show. Contact them as soon as possible after the date of the show has been determined so that they can be engaged before making other commitments. The show chairman or someone he designates should meet with the judges on the morning of the show before the judging starts so that he can discuss with them the point scale to be used in judging, the number of points required for each ribbon awarded, and the higher trophies and awards that they are expected to determine. In setting the point scale care and good judgment should be exercised, taking into account the number of entries, the weather and any other factors so that when the scale is set the entrants will be encouraged and not discouraged; nevertheless, standards of excellence should not be compromised merely to allow a greater number of ribbons to be given out. It is a good idea to have someone familiar with judging meet with the judges for discussion of these points. If a member of your club is an accredited amaryllis judge, he would be an excellent choice for the assignment.

Clerks to assist the judges and to record their decisions must be chosen in advance and instructed in their duties and deportment during the judging. A short sheet of instructions to the clerks comes in very handy and can be issued to them weeks before the show so that they will know what is expected of them on the morning of the show. Before going onto the floor with the judges a short refresher talk by the show chairman or his designee should be addressed to the clerks.

The physical set-up of the show is a very important facet of any show. The placing of the tables on which the entries rest will be largely determined by space limitations but it should be done in a logical arrangement and yet not overlooking the aesthetic aspects. Tables can be arranged in a straight line or can be placed in a broken straight line with each individual table or groups of tables placed at an angle, say 45 degrees, for an effect that is very gratifying, making it seem that

there are an even greater number of entries on the floor than are actually there. Space should be alloted to the various sections and divisions in accordance with the anticipated number of entries in each from past experience but be certain that it is flexible enough so that each can be expanded (or contracted) to accommodate an unforeseen increase (or decrease)in the number of entries. A loose or bad arrangement of the tables can detract from the effectiveness of the show and even cause embarrassment. A diagram of the physical set-up of the tables on the floor, showing the space alloted to each section and its subdivisions, is very helpful to the placement committee, in fact almost indispensable, Printed signs should be placed on the tables identifying each section and subdivision for the guidance of the placement committee and also for the public. Markers should be placed between subdivisions to clearly delineate the physical space limits of each. Identification markers, printed cards or such, should be furnished for named varieties and placed alongside of the group as an aid to identification to the viewer.

The flow of the entries on the morning that they are being accepted is extremely important in order to speed up operations and meet the deadline that has been set for judging to commence. A table or tables should be set up to register the entries by filling out the entry card, showing the name of the owner and the name of the plant. The plant is then taken to the classification section where the entry card is completed to show whether the plant is registered or not and to what Section and Division it belongs. In order to determine whether an entry is registered or not it is necessary to have on hand the 1964 Plant Life and succeeding issues which list all registrations to date. The entry is then transferred to the placement committee for removal to its place on the proper table on the floor for ultimate judging in its own section. Be careful that entries are not misplaced which could possibly cause judges to disqualify the entry. As a final precaution, before the judges come onto the floor, a check should be made by the show chairman and the classification committee to detect and correct any errors that may have been made in placement of the entry. This will avoid any embarrassment to all concerned. Once judging commences, no one but the judges and clerks are to be allowed on the floor. However, the show chairman should be on the scene to resolve any questions that may arise, if called upon to do so.

Containers for cut specimens must be furnished by the club sponsoring the show and should be uniform. Bottles have been used but are generally unsatisfactory. On the other hand, cans that are rather tall, such as those used for luncheon meats by grocers or institutions, can be had and sprayed on the outside with aluminum paint to present a very pleasing and uniform appearance. Covering each pot in which an entry is growing, with aluminum foil from the bottom to the upper rim will also present a uniform appearance when they are placed on the tables and at the same time mask any soiled spots or identifying marks present on the pot. The show chairman should make arrangements to have on hand at the registration desk a supply of aluminum foil in the event en-

tries appear without the proper wrapping and also a supply of supports for the scapes if needed and wire "twistems" for use in tying. It is a good idea to make these things available to the entrant but he should be directed to make the necessary support of the scape himself.

In general the above remarks are directed to the horticulture section of the show. If arrangements featuring amaryllis are to be a part of the show, invitations to garden clubs or groups must be issued in ample time for them to accept and notify the show chairman of their acceptance. A theme is agreed upon and appropriate pedestals and/or niches with the proper background must be supplied for these arrangements. Judges qualified to judge arrangements must be present to take care of that part of the judging. It is certainly a nice gesture on the part of the club sponsoring a show to furnish refreshments for the judges before they start their chores and some token of appreciation to be taken home with them is always in order.

As set forth in the opening remarks any successful show is dependent on advance planning but chances are that no matter how many pains are taken to plan ahead, when the show finally is in progress it will be discovered that some little detail has been slighted or overlooked. Let me tell you from personal experience that this should not discourage you but should serve to reinforce your determination to make the next one an even better one! Good luck in your endeavors.

RECOMMENDED SHOW SCHEDULE—OFFICIAL AMARYLLIS SHOWS

The following schedule has been adapted from the 1967 schedule worked out by Mr. Mahan, Registrar, and Show Chairman, Men's Amaryllis Club of New Orleans. Mrs. A. C. Pickard of the Houston Amaryllis Society has suggested the addition of numbered new *Amaryllis* species under Section III and this has been adopted. Under Floral Arrangements Sections, "Section XI.—Floral Arrangements featuring Amaryllis" has been added to complete the Official schedule.

Other local societies may use this as a model in working out their own schedules.

A. HORTICULTURAL SECTIONS—POTTED SPECIMENS

SECTION I—Registered and Named Hybrids

	By	Name
Div. 2—Long Trumpet Hybrids	"	"
Div. 3—Belladonna Type Hybrids		
Div. 4—Reginae Type Hybrids		
A. Markedly Imbricated Type	"	"
B. Less Imbricated Type	"	"
Div. 5—Leopoldii Type Hybrids		
A. Markedly Imbricated Type	"	"
B. Less Imbricated Type	"	"
Div. 6—Orchid-flowering Hybrids	"	"
Div. 7—Double Hybrids	"	"
Div. 8—Miniature Hybrids	"	"
Div. 9—Unclassified Hybrids	"	"

SECTION II—Non Registered and Un-Named Hybrids

Div. 2—Long Trumpet Hybrids	By Color
Div. 3—Belladonna Type Hybrids	" "
Div. 4—Reginae Type Hybrids	
A. Markedly Imbricated Type	" "
B. Less Imbricated Type	" "
Div. 5—Leopoldii Type Hybrids	
A. Markedly Imbricated Type	" "
B. Less Imbricated Type	" "
Div. 6—Orchid-flowering Type Hybrids	" "
Div. 7—Double Hybrids	" "
Div. 8—Miniature Hybrids	" "
Div. 9—Unclassified Hybrids	" "

SECTION III—Cultivated Wild Species

By Name or number

SECTION IV—Non Registered and Named Hybrids

Div. 2—Long Trumpet Hybrids	By Name
Div. 3—Belladonna Type Hybrids	" "
Div. 4—Reginae Type Hybrids	
A. Markedly Imbricated Type	" "
B. Less Imbricated Type	" "
Div. 5—Leopoldii Type Hybrids	
A. Markedly Imbricated Type	" "
B. Less Imbricated Type	" "
Div. 6—Orchid-flowering Hybrids	
Div. 7—Double Hybrids	" "
Div. 8—Miniature Hybrids	" "
Div. 9—Unclassified Hybrids	" "

B. HORTICULTURAL SECTIONS—CUT SPECIMENS

SECTION V—REGISTERED AND NAMED HYBRIDS — By Name
Same subdivisions as Section I

SECTION VI—Non-Registered and Un-Named Hybrids — By Color
Same subdivisions as Section II

SECTION VII—Cultivated Wild Species — By Name

SECTION VIII—Non-Registered and Named Hybrids — By Name
Same subdivisions as Section IV

COLOR CATEGORIES:

Solid White	* White with other color
Solid Pink	* Pink with other color
Solid Salmon	* Salmon with other color
Solid Rose	* Rose with other color
Solid Orange	* Orange with other color
Solid Light Red	* Light Red with other color
Solid Dark Red	* Dark Red with other color

* The named color shall be the predominating color.

C. FLORAL ARRANGEMENTS SECTIONS

SECTION IX—Single Floret Specimens

Registered and named only—by name. Competition in this section is open only to members of the Men's Amaryllis Club of New Orleans,

Inc.,** and limited to three entries per member, grown and bloomed by the member-owner.

SECTION X—Two-floret Specimens

Scapes with two florets, Registered or Non-Registered, Named or unnamed, potted or cut specimens. Not to be judged in competition against any entry in horticulture sections and will be awarded special ribbons of appreciation where deserving.

SECTION XI—Floral Arrangements featuring Amaryllis

No awards or ribbons in Sections IV, VIII, IX, and X can be counted toward any higher award or toward any of the sweepstakes awards.

** The local Amaryllis society can insert its name in place of the Men's Amaryllis Club of New Orleans, Inc.

APPLICATION PROCEDURE FOR TAKING THE OFFICIAL AMARYLLIS JUDGES EXAMINATION

The following application form has been prepared by Mrs. Bert Williams and W. Quinn Buck, and has been approved by the Southern California Amaryllis and Hemerocallis Society, and the American Amaryllis Society (affiliated with the American Plant Life Society). This procedure applies only to the Southern California area.

APPLICATION BLANK FOR TAKING THE OFFICIAL AMARYLLIS JUDGES' EXAMINATION OF THE AMERICAN AMARYLLS SOCIETY (AFFILIATED WITH THE AMERICAN PLANT LIFE SOCIETY).

The requirements for becoming an Official Amaryllis Judge:

1. Current membership in The American Plant Life Society (The American Amaryllis Society), and in the affiliated local society giving the Official Judges' examination.

2. Growing of at least 15 named hybrid Amaryllis clones. (This requirement can be waived **only** if the Examining Judges know of the applicant's experience over a period of years, and believe him to be qualified to take the examination because of his experience).

3. At least 3 years' experience in growing hybrid Amaryllis clones and species.

4. Applicant must pass a preliminary examination satisfying the Examining Judges of his appreciation and understanding of the elements of a good Amaryllis.

5. Applicant must pass the Official Judges' examination. After grading by the examining Judges, who must agree unanimously that the applicant has answered the questions correctly, the examination paper will then be sent to the Officers of the American Amaryllis Society (affiliated with the American Plant Life Society), who have the duty to do the final grading and the accrediting of the new Judge. Thereafter, the Official Judge will be eligible to judge in any Official Show of the American Amaryllis Society, when invited to judge by the appropriate Show Chairman, who should consult the Senior Judge of the area or check the lists of accredited Official Judges as published in PLANT LIFE annually.

6. All Official Judges must attend regular Judges' Council meetings in order to keep informed about new developments.

. . . . . .

Applicant's name . . . . . .

Address . . . . . .

City . . . . . State . . . . . Zip Code . . . . .

Number of named clones grown . . . . . Years of Experience . . . . .

AMARYLLIS NOTES, 1968

HAMILTON P. TRAUB

Hymenocallis amancaes subsp. *herbertiana* Traub, *subsp. nov.* Syn.- *Ismene amancaes* var. 2, Herb. Amaryll. 222. 1837.

Poculo staminali in lobos non fisso; odore jucundiore.

Tepalsegs spreading, staminal cup not cleft into lobes, but including the filaments and projecting 6.5 mm. beyond their insertion; scent more agreeable. Peru. It is hoped that some one will re-collect this plant.

Milleae Traub, *tribus nov.*, *(Amaryllidac.)*. Rhizoma cormosa; perigonium regulare; ovarium ad apicem gynophorii positum. Typus: Genus *Milla* Cav.

Brodiaeeae Traub, *tribus nov.*, Perigonium regulare, inferne tubulosum, superne in segmentis 6 divisum; rhizoma cormosa; pedicelli ad apicem saepe articulati. Typus: genus *Brodiaea* J. E. Smith.

Tristagma narcissoides (R. A. Phil.) Traub, *comb. nov.* Syn.- *Stemmatium narcissoides* R. A. Phil., Anal. Univ. Chile 43: 551-552. 1873.

Nothoscordum graminifolium (R. A. Phil.) Traub, *comb. nov.* Syn.- *Steinmannia graminifolia* R. A. Phil. Anal. Univ. Chile p. 10. 1884.

Narcissus x *perezlaraii* Traub, *nom. nov.* Syn.—*Carregnoa dubia* perez-lara, Anal. Soc. Esp. Hist. Nat. 11: 399.1882, non *Narcissus dubia* Gouan, Illustr. et Obs. Bot. 22. 1773.

Amaryllis starkii Nelson & Traub, *sp.* nov., Plant Life 19: 37-40, Figs. 7 & 8. 1963. *Holonomenifer:* Ira S. Nelson, n. 1134, Univ. S.W. La. Herbarium: *isonomenifers*: Ira S. Nelson, s. n. (=nos. 1081 & 1082 TRA). Nomenifer specimens not cited originally in 1963 due to an oversight.

Narcissus loiseleuri (Rouy) Traub, *comb. nov.* Syn.—*Narcissus triandrus* var. *loiseleuri* Rouy, in Flore de France. 1908.

Narcissus radiiflorus var. *exsertus* clone 'Poetarum', Traub, *clone nov.* Syn.- *Narcissus poetarum* Haw., Mon. Narciss. 14. 1831; Pugsley, Jour. Bot. Vol. 53, Suppl. 2. page 42. 1915.

Pancratium landesii Traub, *sp. nov. (Amaryllidac.)*.—Foliis oblongis, parte inferiori angustatis; umbella uniflora; segmentis tepalorum linearibus acutis; poculo staminali segmentis tepalorum dimidio breviore. (Fig. 14). On coast near Salahah, Zufur Region, Sultanate of Muscat and Oman.

Fig. 14. Pancratium landesii Traub, sp. nov. Collected and photographed by Hugh C. Landes, in 1963, on the coast near Salahah, Zufur region, Sultinate of Muscat and Oman. Mr. Landes was then engaged as food consultant in Muscat and Oman.

Tribe *Hesperocalleae* Traub, *tribus nov.*, subfam. *Allioideae* (Amaryllidac.) Odora plantae alliacea; rhizoma bulbosa; foliis linearibus; inflorescentiis terminalibus racemiformibus; floribus fragrantibus per bracteis subtentibus. Typus: genus *Hesperocallis*. A. Gray.

Infrafamily *Allioidinae* Traub, *infrafam. nov.*, subfam. *Allioideae* (Amaryllidac.). Rhizoma rhizomatosa vel bulbosa; floribus regularibus vel irregularibus; staminibus certis 6 vel 3. Typus: genus *Allium* L.

Infrafamily *Brodiaeoidinae* Traub, *infrafam. nov.*, subfam. *Allioideae* (Amaryllidac.) Rhizoma cormiformi; floribus regularibus; ovario ad apicem pedicelli vel in gynophoro gerente; staminibus certis 6 vel 3. Typus: genus *Brodiaea* J. E. Smith.

TRAUB—**AMARYLLIS NOTES,** continued on page 19.

IMPROVEMENTS IN THE CLASSIFICATION OF THE GENUS **NARCISSUS** L.

ABÍLIO FERNANDES
Botanical Institute, University of Coimbra, Portugal

Some caryological studies accomplished recently on the genus *Narcissus* L. have led us to a somewhat different classification from that which we published in 1951. This classification is outlined here with reference to the caryological data.[1]

GENUS **NARCISSUS** L.

Sp. Pl. *1*: 289 (1753); Gen. Pl. ed. 5: 141 (1754).

Subgen. I. **Hermione** (Haw.) Spach, Hist. Vég. Phan. **12**: 443 (1846)

$x=5$, $x_2=10$, 11 (5+6); $x_3=11$. Chromosome complements always with cephalobrachial elements, rarely with one long only, often with several (6-8) long and short. Polyploidy frequent.

Sect. I. **Serotini** Parl., Fl. Ital. **3**: 157 (1858) p.p. excl. **N. elegans** Spach.

$x=5=1$ LL+1 'Ll+1 LP+1 L.+1 li, or $x=15=2$ LL+2 LP+3 Lp+1 L.+2 li+1 P.'+4 P.

1. *N. serotinus* L.
   var. *serotinus* (2x, 6x)
   var. *emarginatus* Chabert *
   var. *deficiens* (Herb.) Baker *

Sect. II. **Hermione**
$x_2=10$; $x_3=11$.
Subsect. I. **Angustifoliae** A. Fernandes in Bol. Soc. Brot. sér. 2, **40**: 309 (1966).
2. *N. elegans* (Haw.) Spach
   var. *elegans*, $x_2=10=2$ Lp+2 L.+1 li+1 lp+1 P.'+3 P.
   var. *intermedius* J. Gay, Idem
   var. *flavescens* Maire *
   var. *fallax* Font-Quer, $x_2=10=3$ Lp+2 L.+1 P.'+3 P.+1 pp
Subsect. II. **Hermione**
Ser. I. **Hermione**
$x_2=10=2$ Lp+2 L.+1 li+1 lp+1 P.'+3 P.
3. *N. corsyrensis* (Herb.) Nym.*
4. *N. tazetta* L. (2x)
5. *N. ochroleucus* Lois.*
6. *N. patulus* Lois. (2x)
7. *N. cypri* Sweet (3x)
Ser. II. **Luteiflorae** Rouy, Fl. Fr. **13**: 42 (1912).
$x_3=11=1$ Lp+2 L.+1 li+1 L.+2 P.'+3 P.+1 pp
8. *N. italicus* Ker-Gawl. (2x)
9. *N. Bertolonii* Parl.
   var. *Bertolonii* (2x)

[1] In this report, x, x_2 and x_3 mean, respectively, primary, secondary and tertiary basic chromosome numbers; the chromosomes in the haploid formulae (haploid chromosome complements) are represented by the symbols devised in our works of 1931 and 1934 (see bibliographical list); the degree of polyploidy of the taxa is indicated by 2x, 3x, 4x, etc.; an asterisk following the name of a taxon indicates that it has not yet been studied caryologically.

var. *algericus* (Roem.) Maire & Weiller *
var. *primulinus* Maire *
var. *discolor* Batt.*
10. *N. aureus* Lois. (2x)
11. *N. cupularis* (Salisb.) Bertol. ex Schultes f.*
Ser. III. Albiflorae Rouy, Fl. Fr. **13:** 49 (1912).[2]
x_3=11=1 Lp+2 L.+1 li+1 l.+2 P.'+3 P.+1 pp
12. *N. pachybolbus* Dur. (2x)
13. *N. canariensis* Herb. (2x)
14. *N. panizzianus* Parl. (2x)
15. *N. barlae* Parl. (2x)
16. *N. polyanthos* Lois. (2x)
17. *N. papyraceus* Ker-Gawl. (2x)

Sect. III. **Aurelia** (J. Gay) Baker, Hand. Amaryll.: 12 (1888).
x_2=11 (5+6)=1 LL+1 Lp+2 L.+1 l.+1 P.'+4 P.+1 pp
18. *N. broussonetii* Lag.
f. *broussonetii* (2x)
f. *grandiflorus* (Batt. & Trab.) Maire (4x)

Subgen. II. **Narcissus**
x=7; x_2=14. Chromosome complements usually without cephalobrachial elements, rarely with one short (*N. guditanus, N. minutiflorus, N. obesus* and some tetraploid derivatives of *N. fernandesii*). Polyploidy present in certain sections, absent in others.

Sect. I. **Jonquilla** DC., Fl. Fr. **6:** 325 (1815); in Redouté, Liliac. **8:** Adnot. t. 486 (1816) p.p.
Subsect. I. Jonquilla
x=7=2 Ll+1 Lm+1 Lp+1 li+1 lp+1 lp'. Polyploidy present in some species.
19. *N. jonquilla* L.
var. *jonquilla* (2x)
var. *henriquesii* Samp. (2x)
var. *minor* (Haw.) Baker *
var. *stellaris* Baker *
20. *N. fernandesii* Gomes Pedro
var. *fernandesii* (2x)
var. *major* A. Fernandes (4x)
21. *N. willkommii* (Samp.) A. Fernandes (2x)
22. *N. viridiflorus* Schousb. (4x)
Subsect. II. Juncifoliae, subsect. nov.[3]
x=7. Polyploidy unknown.
23. *N. requienii* Roem.
var. *requienii*, x=7=2 Ll+2 Lp+1 li+1 Pp+1 Pp'
var. *pallens* (Freyn. ex Willk.) A. Fernandes *
24. *N. gaditanus* Boiss. & Reut., x=7=2 Ll+1 Lp+1 Lp'+1 li+1 Pp+1 P.
25. *N. minutiflorus* Willk, Idem

Sect. II. **Apodanthae** A. Fernandes in Bol. Soc. Brot ser. 2, **40:** 241 (1966).
x=7=1 LL+2 Ll+1 Lp+1 li+1 lp+1 Pp'. Polyploidy unknown.
26. *N. rupicola* Duf.
ssp. *rupicola* (2x)

[2] **N. dubius** Gouan, a hybrid between a tetraploid form of **N. Requienii** Roem. and a diploid form of a species of the Ser. **Albiflorae**, with 2n=30 (28 R+ +22 A), may be placed in this series.

[3] Plantae graciles; folia viridia, valde angusta, supra leviter canaliculata, infra convexa et leviter striata; perigonii tubus interdum incurvatus; flores fragrantes.

ssp. *pedunculatus* (Cuatr.) Laínz *
ssp. *marvieri* (Jah. & Maire) Maire & Weiller *
27. *N. watieri* Maire (2x)
28. *N. scaberulus* Henriq. (2x)
29. *N. calcicola* Mendonça (2x)

Sect. III. **Ganymedes** (Haw.) Schultes f. in Syst. Veg. **7**, 2: 933 (1830). x=7=3 Lp+1 li+2 PP+1 Pp'. Polyploidy unknown.
30. *N. triandrus* L.
var. *triandrus* (2x)
var. *cernuus* (Salisb.) Baker (2x)
31. *N. concolor* (Haw.) Link (2x)

Sect. IV. **Bulbocodium** DC., Fl. Fr. **6**: 319 (1815); in Redouté, Liliac. **8**: Adnot. t. 486 (1816).
x=7; x_2=13. Polyploidy very frequent.
32. *N. bulbocodium* L.
var. *bulbocodium*, x=7=3 Lp+1 li+2 PP+1 Pp' (2x, 3x, 4x, 6x)
var. *nivalis* (Graells) Baker, Idem (2x)
var. *graellsii* (Webb) Baker *
var. *conspicuus* (Haw.) Baker (4x, 6x)
var. *serotinus* (Haw.) A. Fernandes (4x, 6x, 7x, 8x)
var. *citrinus* Baker (2x)
ssp. *praecox* Gatt. & Weiller
var. *praecox* *
var. *paucinervis* Maire *
33. *N. obesus* Salisb., x_2=13=1 Ll+4 Lp+1 'Lp+1 li+4 PP+1 Pp+1 P. (2x, 3x)
34. *N. hedraeanthus* (Webb & Heldr.) Colmeiro *
35. *N. romieuxii* Br.-Bl. & Maire, x_2=14=5 Lp+2 li+1 lp'+5 PP+1 Pp'
ssp. *romieuxii*
var. *romieuxii*
var. *rifanus* (Emb. & Maire) A. Fernandes
ssp. *albidus* (Emb. & Maire) A. Fernandes
var. *albidus*
var. *zaianicus* (Maire, Weiller & Wilczek) A. Fernandes
36. *N. cantabricus* DC., x=7=2 Lp+1 li+1 lp'+3 PP
ssp. *cantabricus*
var. *cantabricus* *
var. *foliosus* (Maire) A. Fernandes (4x)
var. *Kesticus* (Maire & Wilczek) A. Fernandes (4x)
var. *petunioides* A. Fernandes *
ssp. *monophyllus* (Dur.) A. Fernandes (2x)
ssp. *tananicus* (Maire) A. Fernandes (4x)

Sect. V. **Pseudonarcissus** DC., Fl. Fr. **6**: 319 (1815); in Redouté, Liliac **8**: Adnot. t. 486 (1816).
x=7=1 Ll+1 LP+1 Lp+2 li+1 lp+1 Pp'. Polyploidy frequent.
37. *N. longispathus* Pugsley (2x)
38. *N. nevadensis* Pugsley *
39. *N. hispanicus* Gouan
var. *hispanicus* (2x, 3x, 6x)
var. *propinquus* (Herb.) Pugsley (2x)
var. *spurius* (Haw.) Pugsley *
var. *concolor* (Jord.) Pugsley *
40. *N. confusus* Pugsley *
41. *N. obvallaris* Salisb. (2x)
42. *N. portensis* Pugsley (2x)
43. *N. pseudonarcissus* L.
var. *pseudonarcissus* (2x)
var. *platilobus* (Jord.) Pugsley *
var. *insignis* Pugsley *

var. *pisanus* (Pugsley) A. Fernandes *
var. *montinus* (Jord.) Pugsley *
var. *minoriformis* Pugsley *
var. *humilis* Pugsley *
var. *festinus* (Jord.) Pugsley *
var. *porrigens* (Jord.) Pugsley *
44. *N. pallidiflorus* Pugsley
var. *pallidiflorus* (2x)
var. *intermedius* Pugsley (2x)
45. *N. macrolobus* (Jord.) Pugsley *
46. *N. gayi* (Hénon) Pugsley (2x)
47. *N. nobilis* (Haw.) Schultes f.
var. *nobilis* (4x, 6x)
var. *leonensis* (Pugsley) A. Fernandes (6x)
48. *N. moschatus* L. (2x)
49. *N. alpestris* Pugsley (2x)
50. *N. tortuosus* Haw. (2x, 4x)
51. *N. albescens* Pugsley *
52. *N. bicolor* L.
var. *bicolor* *
var. *lorifolius* (2x)
53. *N. abscissus* (Haw.) Schultes f.
var. *abscissus* (2x)
var. *serotinus* (Jord.) Pugsley *
var. *graciliflorus* Pugsley *
var. *tubulosus* (Jord.) Pugsley *
54. *N. minor* L. (2x)
55. *N. provincialis* Pugsley *
56. *N. pumilus* Salisb. (2x)
57. *N. nanus* Spach (2x)
58. *N. parviflorus* (Jord.) Pugsley *
59. *N. asturiensis* (Jord.) Pugsley (2x)
60. *N. cyclamineus* DC. (2x)

Sect. VI. Narcissus
x=7=1 LI+1 LP+1 Lp+2 li+1 lp+1 Pp'. Polyploidy present.
61. *N. poeticus* L.
var. *poeticus* (2x, 3x)
var. *verbanensis* Herb.*
var. *hellenicus* (Pugsley) A. Fernandes *
var. *recurvus* (Haw.) A. Fernandes (3x)
var. *majalis* (Curtis) A. Fernandes *
62. *N. radiiflorus* Salisb.
var. *radiiflorus* (2x)
var. *stellaris* (Haw.) A. Fernandes *
var. *exsertus* (Haw.) A. Fernandes *

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NOTHOSCORDUM NOTES, 1967

Pedro Felix Ravenna, *Buenos Aires, Argentina*

In the 1967 PLANT LIFE (vol. 23, page 50), the name *Nothoscordum lloydiflorum* Beauv. was restored, but further study has revealed that the correct name of this species is:

Nothoscordum vittatum (Griseb.) Rav. *comb. nov.* Syn.—*Milla vittata* Grisebach, Goett. Abhandl. 24:318. 1879.- *Nothoscordum lloydiflorum* Beauverd, Bull. Herb. Boiss. ser. 2, 8:998, f. 2. 1908.-*Beauverdia vittata* (Griseb.) Herter, Boissiera 7:511. 1943.-*Beauverdia lloydiflora* (Beauv.) Herter. l. c.: 510.- *Ipheion vittatum* (Griseb.) Traub, Pl. Life 5:50. 1949.- *Ipheion lloydiflorum* (Beauv.) Traub, l c.- *Tristagma vittatum* (Griseb.) Traub, l.c. 19: 61. 1963.- *Tristagma lloydiflora* (Beauv.) Traub, l.c.

Specimens: Uruguay, Canelones, Independencia, in campis; leg. C. Osten 5222, 3-V-1908 (iso-type of *N. lloydiflorum* SI). Argentina Entre Ríos, Concepción del Uruguay, en el campo entre las gramas. fl. blanca; leg. Lorentz 968, 1-V-1877 (isotype of *Milla vittata* BAF).

This species possibly is not distinct from *Nothoscordum setaceum* (Bak.) Rav. (see below), of which unfortunately I had access only to a phototype. *Nothoscordum lloydiflorum* Beauv. differs from it mainly by the more papillose and narrower leaves; these characters are variable and are of doubtful significance in characterizing species.

Nothoscordum setaceum (Bak.) comb. nov.- *Milla setacea* Baker, Journ. Linn. Soc. London 11:385. 1871.- *Tristagma setaceum* (Bak.) Traub, Pl. Life 19:61. 1963.

Owing to the fact that this species was never recollected in the province of Tucumán, I feel reluctant in stating place of origin. Possibly it is a native of the province of Santa Fe, which was on Tweedie's route, or may be even to Entre Ríos. It is known that some specimens from that collector were wrongly labelled by him or by persons who received them.

Specimen: Argentina, Tucumán; leg. Tweedie (phototype from K).

SUCROSE AS THE SOLE CONSTITUENT OF THE HONEY OF **CRINUM ASIATICUM**

Judy L. Zorbach and William W. Zorbach

Early in the summer of 1964, the writers obtained two magnificent specimens of *Crinum asiaticum* L. from Mr. Wyndham Hayward; these were planted in a small, but well-prepared bed in their garden in Washington. Although it is possible to winter over this species in the Washington area with a great deal of protection, the results are not satisfactory, especially if arrival of spring is delayed.

To avoid risk of loss or damage to the newly acquired specimens, each was removed from the yard in early fall, and replanted in 16-inch redwood tubs in "gritty" (sandy) soil. Before the first frost arrived the tubs were brought inside the writers' conservatory, the construction of which had just been completed. Under these conditions, the two crinums thrived and bloomed well during the winter months, and around May 1 of the following year they were brought outside and exposed to full sun, and cared for in this way until cold weather arrived, after which they were returned to the conservatory. By June of this year (1967), the bulbs had attained a diameter of about 7 inches: they were at this time cut back severely and carefully removed from the tubs preparatory to shipping to the writers' new location in New Iberia, Louisiana. They were subsequently replanted outside and have already made good growth at this writing.

It was during the winter months in Washington in the conservatory when the honey production of *C. asiaticum* was acutely noted, for, under these conditions, the leaves were not washed clean by the rain, and an opportunity for the careful observation of the behavior of the flowers was provided. It will be disclosed later on that the sole constituent of the honey is sucrose, but this is not at all surprising, inasmuch as the sugar occurs almost universally throughout the plant kingdom in the

juices, seeds, leaves, fruits, flowers, and roots of plants; sucrose was reported in all of the 281 species of phanerogams studied by Bourquelot and his associates *(1)*.

What is remarkable is that, in light of our somewhat limited experience, *C. asiaticum* produces *copious* quantities of honey. As the individual flowers wilt, a clear, colorless sirup exudes from the throats of each, forming drops which frequently fall upon the leaves. The sirup is a very concentrated solution, as evidenced by the fact that the drops do not run down the leaves in watery fashion, and also because the sirup thus collected becomes completely crystalline in a few days. It is estimated that each flower produces 2-3 drops of sirup, accounting for 250-500 mg. of sugar, and, from an average of 15 blooms per umbel, this would amount to 3.75-7.5 grams! Of the various other amaryllids, and, in particular, of several other crinums grown by the writer, such a profuse exudate of honey has not been noted.

Although it is unlikely that the constitution of the honey of *C. asiaticum* has been previously reported, an exhaustive literative search was not made. Regardless of possible priority, the authors set about independently to perform constitutional studies in an effort to identify the "new" sugar, with a view to preparing an article of possible interest to amaryllid enthusiasts.

Collection of the crystallized honey was made by carefully scraping it from the leaves. Although contaminated by some dust, the crystals had m.p. 191-196° [this is an excellent value for sucrose, which does not have a definite melting point *(1)*. The range varies, depending upon the medium used for purification.] The crystals were then dissolved in methanol, the solution was decolorized and filtered, and a large volume of acetone was added. After two days, the beautifully crystalline sugar was collected by filtration, and had m.p. 188-192°. When admixed with a sample of authentic sucrose (table sugar) of m.p. 186-190°, no depression was observed. The recrystallized unknown sugar failed to give a positive "silver mirror" test with ammoniacal silver nitrate, and did not form a phenylhydrazone; therefore, it was either a non-reducing disaccharide or oligosaccharide. It gave a positive diazouracil test, strongly suggestive of sucrose. Acetylation of the sugar in pyridine gave, after processing, a sirup which crystallized readily from ethanol-pentane after seeding with an authentic specimen[1] of octa-*O*-acetylsucrose. The acetylated derivative had m.p. 85-87°, undepressed when admixed with an authentic sample[1] of octa-*O*-acetylsucrose of m.p. 84.5-86°. The original sugar was homogeneous on thin-layer chromatograms and had an *Rf* value corresponding to that of sucrose. Its optical rotation was $[\alpha]_D$ + 66° in water (lit. *(1)* $[\alpha]_D$ + 66.53° in water). The honey of *C. asiaticum* is, therefore, composed of pure sucrose.

[1] From a sample in the authors' collection, originally prepared by the late Prof. Géza Zemplén, Hungarian carbohydrate chemist and discoverer of the widely used Zemplén method for the saponification of esters, during his brief tenure as visiting professor at Georgetown University, Washington, D. C.

The authors gratefully acknowledge the technical assistance of Dr. and Mrs. K. Venkatramana Bhat.

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BAHAMA ISLANDS **HYMENOCALLIS** SPECIES

W. Quinn Buck

In July of 1964 Dr. Hamilton P. Traub sent to me at the Los Angeles State and County Arboretum, Arcadia, Calif., a group of bulbs which included the very rare *Hymenocallis sp.*, 'Man-o'-War' Cay. (T-

Fig. 15. **Hymenocallis** sp. T-775, collected by Mr. Henry C. Gibson, Jr., on Man-O-War, Abaco, Bahama Islands, in sandy soil. Close up of an umbel as grown by W. Quinn Buck, Arcadia, Calif., in 1967. See also Fig. 16. Photo by Jack V. McCaskill.

775) from Abaco, Bahama Islands. This small bulb was started in a six-inch pot in a mixture of siltsand and peat in equal volume. Early in 1965 it was shifted into a 10-inch fern pot. Since my retirement from the Arboretum in 1965 this species has been growing in the greenhouse at my home, where it has seemed to be quite happy.

Fig. 16. **Hymenocallis** sp. T-775, collected by Mr. Henry C. Gibson, Jr., on Man-O-War Cay, Abaco, Bahama Islands, in sandy soil 1964. Plant as grown in W. Quinn Buck's greenhouse, Arcadia, Calif., the second scape with umbel and the fading first umbel produced in 1967. Photo by Jack V. McCaskill.

Growth has been very good in the bright, warm south half of the greenhouse, where it has received abundant water at all seasons. In 1966 there were two handsome flower spikes, and in 1967 there have been three in succession during August and September, the first from the large center bulb, and then one from each of the large offsets in turn. The 38-inch spike was topped by a widespread 12-inch umbel of clear white, spicy scented flowers. It has so far proved to be a very satisfactory greenhouse plant.

The full-length picture (Fig. 16) shows the second scape with umbel and the fading first scape with umbel of 1967. A third scape with umbel bloomed in late September. The close-up (Fig. 15) shows the handsome umbel.

PLANT LIFE LIBRARY—continued from page 32.

TAXONOMY, by R. E. Blackwelder. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. Subtitled, "A Text and Reference Book", it is in the main "concerned with the practical tasks of the taxonomist." The book is intended for a beginning course, and an advanced one, on the theory of taxonomy, embracing six parts: (a) introduction, (b) elements of practice, (c) animal diversity and the major problems of grouping, (d) advanced practice, (e) theoretical aspects, and (f) special requirements of zoological nomenclature.

MEMORIALS OF JOHN BARTRAM AND HUMPHREY MARSHALL, by William Darlington. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1967. Pp. 585. Illus. $20.00. This reprint of a frequently cited book, first published 117 years ago, will be welcomed by all plant scientists, horticulturists and gardeners. The book is prefaced with chronologies in the lives of John Bartram and Humphrey Marshall, and revised indices to the personal names, ship captains and plant names. This charming book, dealing with 18th century botanical history in the American Colonies, is highly recommended.

THE WILD GARDENER IN THE WILD LANDSCAPE, by Warren G. Kenfield. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1966. Pp. 232. Illus. $7.50. Subtitled, "The Art of Naturalistic Landscaping", this stimulating book provides a new outlook on the subject. The topics covered include five modes of landscape appreciation, revolution in land-use, the art of eliminating, perpetuating and adding plants. This outstanding new book is highly recommended.

POLLEN MORPHOLOGY AND PLANT TAXONOMY: ANGIOSPERMS, by G. Erdtman. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. Reprint Edition. 1966. Pp. 553. Illus. $14.00. This reprint of the 1954 Edition, with corrections and an addendum, will be welcomed by all plant scientists. The topics covered include pollen preparations, pollen and spore morphology, and pollen descriptions of representatives of the plant families. A glossary, bibliography, index and addendum, complete the book. Highly recommended.

BIOCHEMISTRY OF CHLOROPLASTS. Vols. I and II, edited by T. W. Goodwin. Academic Press, Berkeley Square House, Berkeley Sq., London, W. 1.; and 111 5th Av., New York, N. Y. 10003. Vol. I. 1966. Pp. 476. Illus. 115s; $18.00. Vol. II. 1967. Pp. 776. Illus., 160s; $29.00. The first and second volumes of this outstanding new series contain contributions from many authorities. Volume I includes papers on the structure and morphogenesis of chloroplasts; and chloroplast components.—lipids, proteins, lipoproteins, nucleic acids, pigments. Volume II, includes papers on the biogenesis in chloroplasts.—CO_2 fixation, carbohydrates, lipids, proteins and nucleic acids, pigments, photosynthetic phosphorylation; and biosynthetic mechanism in relation to morphogenesis. Highly recommended.

INTERNATIONAL REVIEW OF FORESTRY RESEARCH. Vol. 2, edited by J. A. Romberger and P. Mikola. Academic Press, 111 5th Av., New York, N. Y. 10003. 1967. Pp. 316. Illus. $15.00. This 2nd volume in the series contains contributions from seven outstanding authorities, including the history of forestry research in East Asia; influence of spacing on growth of conifers; influence of sylvicultural practice on wood properties; the forest energy balance; growth rates and growth periodicity of tree roots; and succession of organisms in discoloration and decay of wood. Highly recommended.

SYMBIOSIS. Vol. II, edited by S. Mark Henry. Academic Press, 111 5th Av., New York, N. Y. 10003. 1967. Pp. 443. Illus. $17.50. This 2nd volume in the series contains contributions from six outstanding authorities, including papers on insects and their endosymbionts; insect ectosymbiosis; ectosymbiosis in woodland-inhabiting insects; ectosymbiosis ofaquatic insects; avian symbiosis; and intestinal microorganisms of ruminants and other vertebrates. Highly recommended.

PLANT LIFE LIBRARY—continued on page 95.

3. GENETICS AND BREEDING

AN AMARYLLIS BREEDING PROJECT—1967 REPORT

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To one interested in using the *Amaryllis* species in breeding to produce new and different hybrids the 1967 season was, as usual, a mixture of limited successes and many failures. The limited successes provide the incentive to keep working at a challenging but sometimes frustrating hobby. I will describe some of the successes and omit most of the failures, except in a few cases where the information may be of help to those with similar interests in growing and hybridizing *Amaryllis* species.

First, I would like to make a few general observations in regard to setting seed with *Amaryllis* species and F-1 hybrids. The ability to set seed with the species is certainly much less than for most of the modern hybrid groups (e.g. the Dutch hybrids). Three reasons generally given for inability to set seed with the species are: (1) incompatibility due to differences in chromosome number, (2) incompatibility due to unknown differences which exist between divisions (subgenera) of the species and (3) sterility of one or both of the species being used. The point I want to make is that although a species may be known to be fertile, this does not mean that every clone of that species will be fertile. To cite a few examples: For four years I have tried to set seed, using a wide variety of pollen parents, on a clone of *A. evansiae* and several of its vegetative offsets. Over thirty pollinations were uniformly unsuccessful. Yet the fertility of *A. evansiae* as a pod parent was thoroughly demonstrated by the late Prof. Ira Nelson. Mr. Keith Brown (PLANT LIFE, 1967) reports on his inability to obtain seed using a 'Senorita' hybrid as a pod or pollen parent. I have had no such difficulty with my 'Senorita' hybrid, although it does perform better as a pollen parent. Some years back several individuals reported that *A. forgetii* collected by Dr. Goodspeed (PLANT LIFE, 1956) failed to set seed. *A. forgetii* collected by Dr. Vargas is reported to have set seed with the pollen of *A. reticulata stratifolia*. Two years ago Fred Buchmann and I both obtained *A. forgetii* collected by Dr. Cardenas in Bolivia. Although my plant has not bloomed, Fred has set seed on his and reports on his experiences in this issue.

About the only firm conclusion that can be drawn from these experiences is that some clones of *A. evansiae*, *A. forgetii* and 'Senorita' hybrids will set seed and others will not. If one finds that a certain species will not set seed he should try to obtain the species from another source and the problem may be solved.

I never cease to be amazed by the unique beauty and ease of culture of the 'Senorita' hybrids. Although outdoor culture has not been successful, planting three or four blooming size bulbs to an 8-10 inch pot

gives a spectacular display. During spring, summer and early fall the pots are kept outdoors and monthly applications of liquid fertilizer promote the foliage growth necessary for heavy bloom. The pots are brought indoors early in November (into a glass-enclosed patio) and water applied sparingly. Bloom scapes appear by mid December and I have had bloom at Christmas. Each bulb normally makes two scapes (a few make three) with four to five flowers per scape. The creamy pink flowers are 4-4½ inches across, have a green throat and a wax-like sheen. Because of light conditions on my patio the scapes reach a height of 36-40 inches. In January, 1967 I counted 17 blooms open at one time on four bulbs in a single pot (see Figure 17). The scapes seem to be produced in two groups such that the blooming display lasts about six weeks. As though this were not sufficient, one or two out-of-season bloom scapes may appear during the summer.

'Senorita' performs better as a pollen parent than as a pod parent for me. I have seedlings from 'Senorita' crossed with a wide variety of Dutch hybrids including 'Royal Dutch', 'Christmas Gift', 'Marie Goretti', 'Little Diamond' and 'Golden Triumphator'. Most of these are growing well in outdoor beds, although some are grown in pots. Two (2 year old) seedlings bloomed this past season. One ('Christmas Gift' X 'Senorita') was pale pink, 6-6½ inches across and leopoldii type. Another ('Royal Dutch' X 'Senorita'), was a beautiful light rose. It appears that many of these hybrids produce offsets almost as freely as does 'Senorita', particularly in pot culture. More extensive bloom is anticipated for the 1968 season.

Four years ago I obtained from Prof. Claude Davis a small seedling bulb from the cross (*A. evansiae* x *A. agliae*) x *A. evansiae*. This hybrid has grown very well in pot culture and has bloomed for the past two seasons. In color and form it is almost indistinguishable from *A. evansiae*. About 3½ inches across, it is light cream yellow and of fairly full form. Its culture is easier than *A. evansiae*, not being nearly so critical regarding moisture and tendency to rot. When it first bloomed in 1966 no seed was set. This past season several seed pods were obtained from the original bulb and two of its offsets. Three pods resulted from 'White Christmas' as the pollen parent; only two of about fifty seed germinated. These are growing well and the possibility of large yellow hybrids is an incentive for the future. About a dozen seedlings were obtained by using the pollen of a fine specimen of the Davis hybrid (*A. evansiae* x *A. agliae*). These should give some interesting small yellow hybrids and they appear to be vigorous growers.

Early in 1966 I was able to obtain blooming size bulbs of *A. starkii* and *A. yungacensis*. These bulbs were collected by Dr. Cardenas in Bolivia and sent to Prof. Davis for distribution. *A. starkii* was originally collected by the late Prof. Ira Nelson in Bolivia in 1958 and named as a new species by Nelson and Traub (PLANT LIFE, 1963). This is a very distinctive species, principally because of the almost vertical posture of the perigone. A few weeks after potting my bulb of *A. starkii*, and before any leaf development, a bloom scape appeared. The scape was

two flowered, the flowers being more pink than orange in color and very regular in form. In order to achieve maximum variation of progeny mixed pollen was used on both blooms. Pollen parents included *A. belladonna*, a white Dutch hybrid, the *A. evansiae* hybrid

Fig. 17. **Amaryllis** grown by Mr. Joseph K. Mertzweiller, Baton Rouge, La. Upper left, Hybrid, 'Marie Goretti' x **A. evansiae**; upper right, picotee type from 'Nivalis' x 'Apple Blossom'; lower left, unidentified species Goedert SA 63-20; and lower right, 'Senorita' hybrid, 17 blooms open on 4 bulbs in 10-inch pot.

described previously and two unidentified species. Two pods were set and germination was excellent. At this writing more than fifty seedlings are in their second growing season and there is keen anticipation as to the characteristics of these hybrids. After maturing the seed

pods the parent bulb remained dormant until the spring of 1967. It appears to be a rather weak grower.

A. yungacensis (Cardenas and Nelson, PLANT LIFE, 1965) also bloomed within a few weeks after the bulb was received. This very striking species is noted for its bold color pattern in greenish white and red. One bloom was pollinated using pollen from another clone of *A. yungacensis* and the other was pollinated with pollen from *A. forgetii*. Both pods set and reasonable germination was obtained. The seedlings grew well during the summer and fall, and in March both groups of seedlings were re-potted to give them more room. Almost immediately all went dormant and remained dormant for several months until the pots were moved to a cooler, more shaded location. It is concluded from this experience that *A. yungacensis* and its F-1 hybrids do best when maintained under cool, somewhat shaded conditions. The parent bulb of *A. yungacensis* has shown fairly vigorous growth but it did not bloom in 1967.

A. forgetii was received at the same time as *A. yungacensis*, but has not yet bloomed for me. It is an extremely vigorous grower. Probably the reason for its failure to bloom is that it did not get a thoroughly dry rest period. This fall I plan to withhold water completely from both *A. forgetii* and *A. yungacensis*.

A. pseudopardina is another species which has not bloomed and has been somewhat of a disappointment. The bulb made good growth and three offsets in two years and had become crowded in the pot. In May, 1967 the main bulb was re-potted and the three offsets planted in another pot. Two of the offset rotted almost immediately. At present the original bulb and the remaining offset are showing new growth. It appears that the culture I have provided is not right for this species. If reasonable growth is made prior to late fall I plan to subject it to a dry rest period.

With respect to *A. pseudopardina (= A. leopoldii)* I have a few comments I wish to offer. In 1964 I obtained from Mr. Goedert a blooming size amaryllis bulb under the name 'leopardina hybrid', the name inferring the possibility of it being a hybrid of *A. leopoldii* and *A. pardina*. I believe Mr. Goedert obtained these bulbs from Hawaii Of course there is no guarantee that the proposed parentage for this hybrid is correct. This amaryllis has bloomed very consistently in pot culture. It is fairly large, about seven inches across, very regular in form and with white throat markings not inconsistent with an F-1 hybrid of a species fitting the AMARYLLIS MANUAL description of *A. leopoldii*. It has been my intention to "breed back" by repeated self pollination. Unfortunately no seed could be obtained. Early in 1967, while the bulb was still dormant, I took it out of the pot and planted it in an outdoor bed. It bloomed in April and seed was obtained by selfing. A dozen seedlings are now growing. It will probably be three or more years before these seedlings bloom, and it will be very interesting to see if there are types resembling *A. pesudopardina* or the originally described *A. leopoldii*.

Two other species, *A. umabisana* and *A. mollevillquensis* have not bloomed. They do not grow well in the humid climate of south Louisiana, but are holding their own. *A. umabisana* has two large blue-green leaves and *A. mollevillquensis* has only one leaf at this time. These species are native to high elevations where the climate is cool and dry and it is a great challenge to try to grow them under Louisiana conditions. If they can be induced to bloom but one time it may be possible to cross them with other species or hybrids better adapted to a humid climate and thus introduce new characteristics.

An interesting F-1 hybrid which is proving useful in my breeding program is derived from *A. belladonna* (var. belladonna) X *A. striata* (probably var. fulgida). The plant was obtained as a seedling bulb from Prof. Davis several years ago. Flowers show typical *belladonna* form, are orange red in color and about six inches across. This hybrid sets seed very readily. I have seen many seedlings raised by Prof. Davis from crosses of this hybrid with Dutch clones. The most notable features are (1) very vigorous growth and (2) plentiful offset formation. Some of my own two year old seedlings are the most vigorous growers in my outdoor planting.

A hybrid which bloomed for me for the first time in 1967 was derived from 'Marie Goretti' X (*A. evansiae* x *A. pardina*). The pollen was given to me by the late Prof. Nelson in 1964. Only four seedlings were obtained. In pot culture these vary from very vigorous to almost totally lacking in vigor. The most vigorous plant produced a three flowered scape, leopoldii-type flowers, about seven inches across with nicely ruffled edges. The ground color is light pink with a lacy network of orange veining. Texture and substance are outstanding; in bright light the blooms show a diamond-like sparkle. This hybrid is considered encouraging evidence that beautiful and different varieties can be produced by use of the species or F-1 hybrids with the white Dutch hybrids and is pictured in Figure 17. No seed was set in 1967.

Regarding the white Dutch hybrids, these are a very highly inbred group and may be regarded as species in crossing with other species or even with other Dutch hybrids. A cross made many years ago 'Nivalis' X 'Apple Blossom', was repeated in 1964 and several of these seedlings bloomed in 1967. These were very similar to the earlier progeny from this cross. All are large, full leopoldii types. The base color is white. About 60% have a distinctive picote edge. All have red line or red spotted markings, or both, varying from very slight to fairly pronounced. As a group they are very vigorous growers and very dependable bloomers. One of the more pronounced picote types is shown in Figure 17.

Another group of hybrids showing promising performance in outdoor culture was obtained by using the pollen of *A. striata* (var. *fulgida*, light salmon pink in color) on the white Dutch hybrid 'Marie Goretti'. Five seedlings bloomed in 1967. All were very similar, five to six inch flowers, salmon pink ground color with some orange veining and green throats. Each bulb has produced five or six offsets. I consider these

among the best "different" amaryllis for outdoor culture on the basis of their initial performance.

Finally I would like to offer a few comments on some of the unidentified species imported by Mr. Goedert. I have previously mentioned the species I obtained under number SA 63-20 (PLANT LIFE, 1967). A picture of this species is shown in Figure 17. I consider it to be a form of *A. belladonna* because of its growth habits and capitate stigma. It is the most dependable bloomer among those I have obtained from Mr. Goedert. Selfed seedlings of SA 63-20 are three years old and are growing very slowly and are at least two years from blooming size. Blooming of these selfs should determine whether SA 63-20 is a true species or a natural hybrid. Many seedlings from SA 63-20 X (*A. evansiae* x *A. aglaiae*) should bloom in 1968. Seedlings from 'Royal Dutch' X SA 63-20 are perhaps two years from bloom. Several attempts have been made using the pollen of white Dutch hybrids on SA 63-20. Seed pods were always obtained, but the seed were always devoid of embryos. This past spring I obtained a good crop of seedlings from the cross SA 63-20 X *A. cybister*. The original bulb of SA 63-20 rotted after maturing seed pods this year, but two offsets and the selfed seedlings remain.

Species SA 63-22 has bloomed for the past two seasons and this is definitely a form of *A. striata* (probably var. *striata*). Another species, said to be *A. striata* (var. *acuminata*), also blooms well. I can detect very little if any differences between these two plants. A large number of seedlings were obtained by crossing these two.

Unidentified species which have not bloomed include SA 62-1, SA 62-5, SA 63-10, SA 63-16, LM 63-1 and one said to be *A. maracasa*.

HYBRIDIZING WITH AMARYLLIS SPECIES

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In recent years there has been a return to growing and hybridizing amaryllis species and first-generation hybrids as reported by Nelson (1955, 1960), Smith (1961), Morris (1964), Fesmire (1967) and many others. In view of the many, very beautiful hybrids that are readily available, there must be logical reasons for working with species. The reasons seem clear. (1) New species have been discovered which can add new and distinctive characteristics to the present hybrids. (2) Quite a few previously discovered species, which have been lost to cultivation, have been reintroduced. (3) It seems probable that the presently available species can be combined to produce new and significantly different types either in form, color, color pattern or size. (4) In creating new types, *being able to leave out some species*, with dominant characteristics which went into the first hybrids, may be almost as important as which species are included in the new hybrids.

Since the availability of species (especially to the amateur) is almost completely dependent on others, it seems proper to give credit to

the persons and organizations that have been largely responsible for my progress thus far.

1. Probably the late Prof. Ira S. Nelson at the University of Southwestern Louisiana helped to initiate this latest surge in species hybridizing in connection with the Louisiana Society for Horticultural Research and as a result of his collecting trips to South America in 1954 and 1958. Three new species were discovered (one jointly with Dr. Martin Cardenas), several previously described species were reintroduced, and a number of species and F1 hybrids were made available through the Louisiana Society for Horticultural Research.

2. More recently Dr. Martin Cardenas (Herbert Medalist for 1967) of Cochabomba has collected and Prof. Claude W. Davis of Baton Rouge has imported and distributed a number of Bolivian species which hold great promise to the hybridizer (Davis, 1967).

3. Recently, also, Mr. Robert Goedert (Herbert Medalist for 1965) has imported and distributed a number of unidentified species collected for him in South America.

4. Also, other individual efforts have been most helpful. Prof. Davis has propagated releases from the Louisiana Society for Horticultural Research and also made further crosses with these species or varieties and made these plants widely available. Further, there has been a considerable exchange of plants and pollen between individuals and I feel that this should be encouraged as suggested by Mr. Fesmire (1967).

In the discussion of the individual crosses below, the cross will be identified followed by the year (in parentheses) that the cross was made and in turn (second parentheses) by the number of seedlings now growing (July, 1967). An attempt will be made to discuss consecutively those crosses where a common objective exists or where the species are closely related.

THE QUEST FOR YELLOW HYBRIDS

Many hybridizers are working toward yellow hybrids both in large (leopoldii) and miniature (gracilis) sizes. As will be indicated in later descriptions, one fallout from this effort may be light pink or pink and yellow hybrids which will also extend the color range of present-day hybrids.

Some seedlings from crosses of *A. evansiae* X white dutch described by Nelson (1960) are pink but as pointed out this color probably is genetically unstable since it originated from light yellow and white. Pollen from one of these seedlings was used with 'Maria Goretti' (1965) (30) and 'Winter Carnival' (1965) (15). When these seedlings bloom, many possibilities exist for selfing and sibling the best individuals.

One clone of (*A. evansiae* X *A. aglaiae*) X *A. evansiae* is pale yellow in color and frequently has four florets per scape. One of its siblings (sterile as a pod parent thus far) has a similar pale yellow background but also has many tiny reddish-orange veins giving an orange-pink appearance from a few feet away. A clone of *A. evansiae* X (*A. evansiae* X *A. belladonna*) is a pink-yellow bicolor with predominantly light

pink petsegs and predominantly pale yellow setsegs. As is frequently the case with the progeny of *A. evansiae,* their colors defy adequate description. The following crosses have been made.

(1) [(*A. evansiae* X *A. aglaiae*) X *A. evansiae*] X 'Maria Goretti' (1966) (11). The reverse cross failed.

(2) [(*A. evansiae* X *A. aglaiae*) X *A. evansiae*] X Sib (1966) (9).

(3) [(*A. evansiae* X *A. aglaiae*) X *A. evansiae*] X [*A. evansiae* X (*A. evansiae* X *A. belladonna*)] (1966) (15).

(4) 'Maria Goretti' X [*A. evansiae* X (*A. evansiae* X *A. belladonna*)] (1966) (24).

Another interesting hybrid known as 'Morris Yellow' is from an unrecorded cross made by Mrs. Lloyd Morris of Baton Rouge. One parent may be either *A. evansiae* or 'Senorita' (*A. evansiae* X *A. striata*) and the other parent either 'Nivalis' or 'White Giant'. The 5½ inch florets (four per scape) are full and fairly flat with a slight upward tilt. The color is pale yellow with darker yellow highlights starting in the throat and extending out into the center of the segments and with pale pink lines radiating out from the inner parts of the segments. The following crosses have been made.

(1) 'Maria Goretti' X 'Morris Yellow' (1966) (18).
Reciprocal (1967) (8).

(2) 'Nivalis' X 'Morris Yellow' (1966 and 1967) (58).
Reciprocal (1967) (15).

'Morris Yellow' has also been used as the pollen parent with the following: 'Senorita' (1966) (3); 'Pamela' (1966) (25); a clone from an orange *reginae* hybrid X 'Senorita' (1966) (10); a white gracilis (1967) (7); *A. belladonna major* (1967) (4) and a pink-orange form of *A. striata* (1967) (12).

A clone of [*A. evansiae* X (*A. evansiae* X *A. aglaiae*)] X [(*A. evansiae* X White Dutch) X sib] is an intermediate sized, pink blush on white with a yellow star in the center. It has been used as the pollen parent in 1967 with 'Maria Goretti' (10 seedlings), 'Nivalis' (12), 'Senorita' (2), and the pink-orange form of *A. striata* (25).

In addition to the above and the crosses with 'Senorita' described below, about 200 other seedlings related in some way to *A. evansiae* are in various stages of growth. It is impossible to guess which of these may be most likely to aid in producing yellow amaryllis.

HYBRIDIZING WITH SENORITA

Almost everyone who has written about 'Senorita' has pointed out that words and even pictures fail to adequately describe the beauty of this lovely group of flowers. (Fig. 18) This combined with their vigorous growth and easy blooming seem to strongly recommend 'Senorita' as a parent. Depending on the choice of the other parent, either small or large-flowered hybrids appear possible. 'Senorita' sets seed sparingly, usually on the first one or two florets (out of four) per scape and generally produces 8 to 20 seed about one-half of which are viable. This may vary from one clone of 'Senorita' to another. Using

'Senorita' as the pod parent, three to eight seedlings are in various stages of growth (many very vigorous) from crosses with the following pollen parents: 'Prima Donna', 'Rosaline', 'Golden Triumphator', 'Maria Goretti', 'Picotee Petticoat', 'Constant Comment' and a white gracilis. A plant of 'Senorita' X 'Apple Blossom' has bloomed. It is intermediate in size and has a very light pink background contrasted with a bright green throat and with darker pink lines radiating outward on the segments. It has been crossed with several white dutch hybrids.

Fig. 18. Amaryllis hybrid, 'Senorita' as grown by Fred J. Buchmann, Baton Rouge, La.

The pollen from 'Senorita' sets viable seed easily on a wide variety of both leopoldii and gracilis hybrids. One seedling that is especially interesting is from a cross of 'Constant Comment' X 'Senorita.' (Fig. 19) The gracilis type flowers are light pink shading to tomato red at the outer edges of the segments. However, the most outstanding feature is a dark yellow band (¼ to ⅜ inch wide) extending from the throat about one-third of the length of each of the top three segments. Each band is surrounded by an area about ¼ inch wide of darker reddish-orange, much darker than the background color. This gives an appearance similar to that of the "eye" in some clones of hemerocallis. Possibly this "eye" can be improved and passed on to other colors and sizes of amaryllis. This eyed-clone was the pod parent for a cross with 'Morris Yellow' (1967) (20).

Fig. 19. **Amaryllis** grown by Fred J. Buchmann, Baton Rouge, La. Upper, **Amaryllis forgetii** (Worsley) Traub & Uphof, and lower, eyed clone from a cross of 'Constant Comment' and 'Senorita'.

A. FORGETII, A. YUNGACENSIS, A. AULICA

A. forgetii has been a real joy. It was received on January 8, 1966 and bloomed on March 20, 1966. (Fig. 19) It was kept watered and bloomed again on December 10, 1966. It is not clear whether this latter date will be more nearly its normal blooming time. Pollen from *A. forgetii* set seed on *A. aulica* (var. *stenopetala*?) (30 vigorous seedlings) and also on *A. yungacensis*. This latter cross was made by Joseph Mertzweiller of Baton Rouge and also gave vigorous seedlings. However, all other attempts to use *A. forgetii* pollen were unsuccessful on species, either in the *striata* or *belladonna* groups, dutch hybrids or *gracilis* (all known to set seed easily). On the other hand, *A. forgetii* set seed each time it was pollenated. On December 10 no other fresh pollen was available, so it was selfed and ten not so vigorous seedlings are just now putting on their second leaves; they appeared to go dormant after putting on the first leaf. From the March blooming, eight vigorous seedlings resulted from mixed pollen of 'Maria Goretti' and 'Christmas Gift' (the reverse cross with 'Maria Goretti' failed) and about 40 somewhat slower growing seedlings resulted from mixed pollen of *A. striata*, *A. evansiae* and *A. yungacensis*. In this latter cross it was hoped that three groups of seedlings would be produced. However, careful examination of the seedlings (now about one year old) suggests that fertilization occurred with pollen from only one species. In view of the incompatibilities indicated above for *A. forgetii* pollen, this cross may be from the *A. yungacensis* pollen and be the reciprocal of the cross made by Joseph Mertzweiller. My experience with pollen from *A. yungacensis* has been similar thus far: no seed have resulted with either species in the *striata* and *belladonna* groups or with known seed-setting dutch hybrids with one exception. A small pod was set on 'White Christmas' (1966) and four seedlings are growing moderately well. Crosses failed with 'Nivalis and 'Maria Goretti' which set seed very consistently.

The implication is that the *Aulica* group is somewhat further removed from the *striata* and *belladonna* groups and also from white dutch hybrids than either of these latter three are from each other. It will be interesting to see if further crosses bear out this implication. Also, it will be interesting to see if the above hybrids involving *A. forgetii*, *A. aulica*, *A. yungacensis* and white dutch will produce large, full flowers with four florets per scape. They should be in various combinations of red, white and green and bloom at Christmas time. Because of this potential blooming (and probably growing) time, these hybrids will have to be handled as pot plants in the Baton Rouge area but should do well in areas with a warmer winter climate.

AMARYLLIS PSEUDOPARDINA

A. pseudopardina (*A. leopoldii*—see Plant Life, vol. 21, pages 55-57 and 60-63) has been a horticultural success but a disappointment in hybridizing. Received in October, 1964, it has grown vigorously and

bloomed twice. However, as a pod parent no viable seed have been set with mixed pollen from species in the striata and belladonna groups and from white leopoldii hybrids. Pollen from *A. pseudopardina* was used on everything available—species (again in the striata and belladonna groups), various leopoldii hybrids and several striped "yard flowers" in the reginae division. Result—no seed. If this species should bloom again next year and other plants cooperate, crosses will be attempted with species in the aulica group.

SUMMER-FLOWERING AMARYLLIS

This is an area where absolutely no success has been achieved. *A. aulica* var. *platypetala*, a plant obtained as *A. correiensis* and a plant obtained as *Amaryllis* X *acramanii* all bloomed in July, 1966, but I was unable to get any seed to set.

AMARYLLIS STARKII

A. starkii appears to hold considerable promise for producing pastel, miniature hybrids. Three seed pods have been set resulting in about 100 seedlings. Mixed pollen was used in all cases and involved *A. striata*, (*A. evansiae* X *A. aglaiae*) X *A. evansiae*, *A. belladonna major*, two tiny *A. belladonna* hybrids, 'Senorita', a white gracilis and 'Daintiness'.

UNIDENTIFIED SOUTH AMERICAN SPECIES

An interesting experience occurred in the Spring of 1967 in connection with bulbs imported by Mr. Goedert. Bulbs designated as SA 62-3 and SA 63-16 bloomed about two weeks apart for the first time. They appeared to be the same species but do not fit the description given by the collector for either. They are fairly close to *A. espiritensis* and could possibly be this species. Neither of these set seed to self pollenation but a cross was obtained of SA 63-16 X SA 62-3 and 30 tiny seedlings are now growing slowly.

AMARYLLIS STRIATA

Several forms of *A. striata* are being grown and cross easily with large-flowered hybrids giving very vigorous seedlings. In those that have bloomed thus far, the striata color pattern is strongly dominant and I have been told that this probably will be true for several future generations. Lack of space prevents any very large effort in this direction.

AMARYLLIS BELLADONNA

The Bolivian form of *A. belladonna* collected by Prof. Nelson has many desirable characteristics. It is vigorous, persists when mulched outdoors during our very wet and sometimes cold winters (which none of the forms of *A. striata* will do), blooms easily with four florets per scape and sets seed readily. It has been crossed with leopoldii hybrids and their progeny are being selfed to see if this is a reasonable route to small flowered hybrids in pastel colors. A rose pink form of *A. bella-*

donna collected by Prof. Nelson in 1958 has given a number of light pink hybrids and pollen from some of these has been used with a number of pod parents hoping for light pink in both large and small sizes.

WHAT NEXT?

The plants already growing should provide a seemingly unending succession of potential self pollenations, sib crosses, back crosses and even out crosses. However, there are two other areas which are most inviting.

1. *Long Trumpet Hybrids.* *A. fragrantissima* is growing well and it probably will bloom in 1968. Hopefully, pollen will be available from some suitable long trumpet species when this happens. However, a plant indicated to be *A. elegans* is growing slowly and appears to need several years yet before flowering. *A. umabisana* is barely existing and may never bloom in Baton Rouge; Dr. Cardenas has reported that it has failed to bloom even in Cochabomba.

2. *Orchid-Flowered Hybrids.* *A. cybister* and a plant thought to be *A. maracasa* have just about finished reversing their growing seasons and may bloom in a year or two. Possibly other species with tendencies toward orchid-type flowers can be added.

So, growing and hybridizing amaryllis species is a very enthralling avocation. Don't let anyone kid you, there is a moderate amount of hard work involved but the results are more than amply rewarding.

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1967 AMARYLLIS BREEDING REPORT

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In a previous article, the writer mentioned that he was constructing benches with plastic hoods over them, intending to grow his potted bulbs upon these benches. A year of use has confirmed their value. A check of the bulbs this past spring revealed scarcely a trace of the red virus disease which was so prevalent the previous spring, and most of the seedlings continued to grow slowly all through the winter months. In fact, bulbs of all sizes displayed better growth this past year than ever before, and the credit for this must be given partly to the protection offered by

these hoods from rainfall and the condensation on cold nights, and partly to a program of continual feeding. Every time the bulbs are watered (except during the winter months), they are watered with a weak solution of a soluble fertilizer, such as Fish Emulsion. This program of feeding was adopted after observing the results of its use at a commercial garden nearby, and it paid dividends this spring in the finest blooms the writer has yet had.

The last bulbs of two crosses made between the Houdyshel orange-scarlet hybrids and *A. striata fulgida,* using each as the seed parent, bloomed this past spring, and some observations can be recorded. In the first place, a marked difference in hardiness between the two crosses has become apparent. The hybrids having *A. striata* for the seed parent are very tender; they lose their leaves in the fall, and are prone to decay during the winter months if kept outside. But the hybrids having the Houdyshel Hybrid as the seed parent are quite hardy; the leaves are dark green with a heavy texture, and remain green all winter. In the second place, these evergreen hybrids have much more attractive flowers than the others, being of the Reginae type but only four to five inches in size. In color, they are a salmon orange fading to rose with a touch of green on the reverse side. Thus it paid to make this cross both ways, since one cross was so much superior to the other one. However, the only one showing a recurrent blooming tendency was from the tender cross. This year, a number of very interesting crosses were made with these flowers, including crosses with a *belladonna* X *evansiae* Hybrid, a *vittata* X Dutch hybrid, and with the Peruvian miniature hybrids.

Another example of the value of making a cross both ways can be given, for two crosses between an Indian miniature hybrid and *A. striata fulgida* also gave quite different results. In this case the hybrids having *A. striata* as the seed parent are the ones that are doing very well, being evergreen, while those having the Indian miniature as the seed parent are doing very poorly, several bulbs having decayed completely this past winter. However, after observing some twenty *striata* crosses, it can be concluded that crosses with *A. striata* as the pollen parent will usually be much more vigorous in growth than those using *A. striata* as the seed parent. Typical of many *striata* hybrids having had *A. striata* as the seed bearer is a cross between *A. striata fulgida* and *Skildway,* made by a friend in Pasadena; when kept inside it grows vigorously all winter but when kept outside it goes dormant until spring, and even then grows rather poorly. The species *A. striata* and many of its hybrids seem to require considerable heat at all times for successful growth.

One of the writer's first *A. striata* crosses was between *A. striata fulgida* and a rose-colored South African hybrid. The resulting hybrids were in all shades of pink with flowers averaging 5½″ in diameter, but were very sensitive to any low temperatures, definitely requiring greenhouse care. However, one of these pinks was self-pollinated, and the resulting seedlings have grown quite vigorously here in California, even though kept outside all winter with temperatures close to freezing on

some nights. These should bloom very soon, and the first flowers are being eagerly awaited. Another of these pink hybrids was crossed with a Van Meeuwen white Dutch hybrid, and the first bulb of this cross recently bloomed, producing quite a surprise. The flowers were not a pink in color, but a pale red, edged in darker red, and with a wide streak of pale lavender through the center of each tepalseg. This flower was crossed with a Ludwig recurrent-blooming white Dutch hybrid and with a salmon blend from Van Tubergen.

A number of other *A. striata* crosses with interesting possibilities are also doing very well outside here, but have not yet reached blooming size. Among these are crosses with both Peruvian and Indian miniature hybrids and also with larger types. One cross of particular interest was between a Houdyshel-Dutch hybrid and a miniature form of *A. striata* from Hawaii; the resulting plants are evidently going to be true miniatures, although they are growing very slowly.

In the spring of 1962, a cross was made between the Houdyshel orange-scarlet hybrid and an unnamed Ludwig pink Dutch. The resulting hybrids have been close to my ideal of a "window sill" *Amaryllis*. They are vigorous in growth, with rather short, wide, deep green leaves which remain evergreen until new growth appears in the spring, even when kept outside all winter. The flowers, averaging 6" in diameter, have been beautiful both in shape and color. The tepalsegs are wide, overlapping, slightly reflexed, and of very heavy substance. The colors have varied from light salmon pink through dark rose to a light red and also white marked with red; a touch of green in the throat and on the reverse adds to their beauty. The scapes, from 14" to 19" in height, have carried three or four flowers. Unfortunately, these hybrids have not displayed any recurrent-blooming tendency, but they have been crossed with several *striata* hybrids, and with a recurrent-blooming Peruvian miniature. The first of these crosses should soon bloom.

The Peruvian miniature hybrids mentioned here were raised from seed purchased from R. D. Goedert. Although some of the plants became a little too large to be classified as true miniatures, they are very satisfactory, since they have wide, evergreen leaves and well-formed flowers about 4½" in diameter of either red or white marked with red. These have also been used considerably in the writer's breeding program. One such cross with the Houdyshel orange-scarlet hybrid has produced seedlings with dark, gray-green leaves of extremely heavy texture, which apparently are evergreen and more tolerant of low temperatures than any other seedlings being raised by the writer. Since all of his seedlings are being raised outside, he has come to realize that the factor of hardiness in the modern hybrid Amaryllis needs more emphasis; and so this has become another of his goals.

It has been suggested that if new flower forms and colors are to be introduced into the Amaryllis hybrids, it will be necessary to utilize in our breeding programs some of the more-recently discovered species. If so, there may be something new appear eventually here in Southern California, since many members of the Southern California Hemero-

callis and Amaryllis Society are now engaged in hybridizing activities, and many of these newer Amaryllis species can be found here in various collections. The writer is cooperating with a member in Long Beach in a project to build up a species collection that can be used in breeding work, and many additional species, primarily in the form of seedlings or small bulbs, have been added to this collection the past year, including two yellow-flowered species from Argentina. Some of these acquisitions represent species not yet identified, and were received directly from a friend in South America; it is anticipated that more new species will be received from this same source. Pollen of various species was also received from this friend, but most attempts to use it were unsuccessful, although two crosses were successful. In addition, seeds from a number of direct crosses with such newer species as *A. forgetii, A. starkii, A. evansiae,* and *A. cybister,* have been received from fellow members of our local society. Crosses with the 'Senorita' hybrids are not often successful, but last year one cross, using the 'Senorita' pollen on a Striata hybrid, was successful for the writer. This year, a friend has secured several successful crosses between Dutch hybrids and a 'Senorita' hybrid. Likewise, several crosses have apparently been successful using pollen from a Calyptrata hybrid.

One of the writer's goals is to develop a group of summer and fall-blooming hybrids, and finally a start has been made on this project. When his *A. aulica* X 'Floriade' hybrid bloomed in July of 1965, all crosses with it resulted in failure, but when it bloomed in July of 1966, all crosses using its pollen were successful, although no seed would set on the bulb itself. A flower scape is now coming on this bulb again, and when it blooms in July, perhaps more crosses will be successful. Last year's successes at least furnished the encouragement to keep trying with these difficult hybrids.

An unidentified species received from a friend in Burbank has just bloomed. It has small, pale red flowers with a greenish yellow throat, and is evidently either an inferior form of *A. striata fulgida,* or else *A. striata,* var. *striata.* However, its value lies in the fact that it bloomed in July, and it is the only form of *A. striata* that wants to grow and bloom for the writer here in California. Most of his other varieties of *striata,* which grew fine in a greenhouse in Colorado, simply sulk here in California, even when kept in the house, probably because of the cool temperature along the coast.

Bulbs of *A. reticulata* and the hybrid 'Mrs. Garfield' have been obtained, and seeds or bulbs of several more Aulica crosses have been received from friends. One of these gifts has an interesting history: when the species LM63-1 bloomed last August, the writer could not use the pollen; so it was given to a friend, who in turn sent it on to another friend in South Carolina, who used it successfully in a cross with *A. aulica.* And recently, to complete the circle, a small bulb of this cross finally arrived for the writer.

EXPERIENCES WITH AMARYLLIDS

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General. My experimental programs with Amaryllids are limited in scope to suit a restricted time availability. I have nevertheless tried to make meaningful progress with small facilities in a small space. In my study there are two commercially available small plastic greenhouses, with thermostatically controlled bottom heat, under 24-inch double-lamp Gro-Lux fixtures. In the garage there are two home-made plastic-sheeted greenhouses with controlled bottom heat and Gro-Lux lighting. To the southeast of the house is a home-made A-frame with controlled bottom heat available, and with hinged roof panels of framed hardware cloth which can be covered with solid sheeting or woven shade cloth according to the season. In other areas of the yard there are flush and raised beds, pockets and corners, pots and tubs, and a coldframe with hinged cover panels. The basic essential element is an understanding and helpful wife.

Basic Program. The long range program is composed of four coordinated lesser programs, each adaptable enough to follow the trend and pace of overall results and specific advances. No. 1 is aimed at development of a strain of hybrid Amaryllis to serve as a basic breeding stock. The characteristics sought are high seed production, high germination rate, high survival rate under adverse growing conditions, fast maturation, repeat flowering, disease resistance and—as a bonus—*fragrance*. No. 2 is the development of optimum procedures for controlling flower production, affecting crosses, germination of seeds, seedling survival and accelerated maturation. No. 3 is the development of optimum procedures for making bi-generic crosses. No. 4 is the investigation of special techniques of chemical, gas and electrical treatment of seeds, plants and bulbs.

Breeding Stock. The source "mother" was a common backyard hybrid Amaryllis selected because it survives the standard types of misstreatment exercised by the average homeowner in this area. It is evergreen, flowers readily, sets seed readily, and resists disease. It has survived the digging and replanting that goes along with gardeners' irrepressible generosity with mediocre plants, seems to thrive in almost any type of soil or drainage or exposure, and multiplies rapidly. It has the basic *Amaryllis leopoldii*—*A. vittata* blend of characteristics and coloration. Onto this was crossed a hybrid Amaryllis of Japanese origin which had a pure white blossom with a limited amount of green in the throat, had a graceful shape approaching that of *A. belladonna* on a tall, slender, straight scape, and was *sweetly fragrant*. This white parent would not set the reverse cross, and did not survive its first winter outdoors.

Also crossed onto the mother plant was a large, brilliant orange-red unnamed hybrid Amaryllis with a flat-faced perigone of round-tipped petals with a heavy, coarse texture. Its throat was a deeper red, with

almost no green. Since a cut scape was used, no reverse cross was tried. From the seedlings of these two crosses, selections have been made of the more desirable combinations of characteristics. Of a few hundred seedlings, thus far twenty-two first generation plants have been selected as breeding stock. Some of this original batch, from crosses made in 1960, have not flowered yet. However, in spite of this slow maturation, they will all be kept growing on until they flower because some of the best did not flower until 1966 and 1967. Those which were the earliest to produce strong flowers were crossed, regardless of other characteristics. From these there were several which produced very strong flower scapes early in the third year. Of these only four have so far been adjudged worth preserving. On some of those four, because of their vigor and early maturation, bi-generic crosses were tried. These specimens and some of the first generation specimens displayed marked differences in their useability as parents for bi-generic crosses.

Growing Procedures Developed. The only particularly special procedure has been the use of deep plastic juice pitchers instead of clay pots. The number of control specimens is small, which results in certain reservations regarding the reliability of the data which were recorded. My primarily subjective judgment, based on leaf production, increase in bulb size and root condition, is that the deep containers are generally better. Furthermore, those which matured and flowered first were in the deep pitchers. In both the plastic pitchers, in the standard square plastic pots and in the standard clay pots I start with a layer of ¾ inch crushed rock, then the roots of the plant in a generally used soil about one inch from the rim. Fine sand is sprinkled around and under the base of the bulb and gently packed in. Then quarter-inch crushed rock fills the pot to the rim. There is a reduced incidence of red spot and rotting during the cold, wet season, far below that of bulbs planted deeper in the soil mix. Best germination has been achieved from seeds whose black papery covering has been carefully peeled off before sowing. Seeds thus peeled are laid flat in shallow drills in dampened Terralite which is about two inches thick over a four-inch deep base of half potting mix, half Terralite. The smaller seedlings are grown in a greenhouse under Gro-Lux lights controlled for 16 hours of light, with continuous bottom heat of 70 to 80 degrees F.

Bi-Generic Crosses. Reports will be made as these come into flower.

Special Techniques. When seeds are soaked in colchicine solution, my criterion for "too long" is stunted root growth. By soaking a large batch of seeds, of which a specified number is planted each succeeding day, I derive my private optimum soak times for the different kinds of seeds. For hybrid Amaryllis, less than 24 hours seems to have had little effect on the resultant plants, and more than 48 hours has resulted invariably in plants which dwindled and died. Rubbing a mixture of lanolin and colchicine has not yet been successfully done on any of the plants on which it was tried; all seed pods softened and withered. I have not had any success with rubbing a mixture of lanolin and naphthalene-acetamide into scarfed or scratched seed pods to make them hang

on and mature. Spraying foliage with commercially available gibberellic acid in aerosol containers has had no noticeable effect on any of the Amaryllids. Injection of gibberellic acid (sprayed from the can into a glass and permitted to evaporate for several hours) into resting hybrid Amaryllis bulbs by hypodermic syringe started leaf growth in advance of untreated bulbs, but this seemed to deter their flowering. Exposure of hybrid Amaryllis foliage to carbon monoxide wilted the foliage immediately, but in a few weeks new leaf growth was vigorous and on several plants so treated there was vigorous flower stalk production along with new leaf growth. Exposure of foliage to ethylene gas stimulated flower stalk production, which was useful in bringing selected plants into flower out of their regular season. Passing electrical current through plants has not yet produced any noticeable change; variations of voltage and amperage combinations may be tried later.

Miscellaneous Observations and Random Musings. One *Amaryllis striata* flower in an umbel of three had four parts instead of six; it set no seed when selfed. My experience verifies that reported by other Amaryllid growers: *Chlidanthus fragrans* is reluctant to flower. One of my first generation hybrid Amaryllis seedlings had an umbel of closely grouped flowers of almost equal length tepalsegs which faced nearly upright in the manner of *Brunsvigia rosea.* The stigma did not recurve its styles when mature; and the plant rotted during the cold, wet season. This, plus the way that seedlings can be grouped into sets of almost identical characteristic combinations, raises some interesting conjecture about the lineage of the plain old garden variety of local Amaryllis plants: by careful selection, could one cause a reversion to the individual species types which had a part in the development of our present-day "hybrid"? Growing *Narcissus* from seeds has been rewarding. 'King Alfred' sets seed readily, and 'Soleil d'Or' sets seed occasionally. If a new batch of seed is sown each year, after the fourth year there is a constant procession of distinctly varying flowers each spring. I have no outstanding ones, but several have been good enough to name unofficially after our grandchildren so that each will have his "own" Daffodil. *Tristagma uniflorum violaceum* (the exact identity is questionable) is an excellent source of easy-to-grow bright blue. With development for size, height and brightness of the blue tones, it could be a valuable addition to the color range of the Amaryllids.

1967 HEMEROCALLIS REPORT

W. Quinn Buck, *Chairman, Daylily Committee, American Plant Life Society*

The year 1967 was full of the usual variations from the normal in weather and season in most parts of the country. On the West Coast our blooming season was generally much later than usual, and this was reflected in the lack of bloom in the Stockton, Calif., area, where the regional meeting for Region 7 of the American Hemerocallis Society was

held at Melrose Gardens on June 10. In the evening the Northern California Hemerocallis Society held its annual meeting and dinner at the home of Jack S. Romine in Walnut Creek, following the afternoon garden tours. Mr. Romine had 'Tetra Forty-niner' in bloom in his greenhouse, as well as a chimeric clump of 'Alan' in the garden, both from his efforts at polyploidizing clonal material, and there were a number of very promising spikes on other treated plants. An unflowered treated plant of 'Cartwheels' was sending up a wonderful spike that seemed tetraploid and was the center of interest for certain people. The diploids in this garden also were much behind because of the cool weather, and few were yet in bloom.

On June 12th, on the return to Southern California, we were able to visit three very delightful gardens in Bakersfield, where their heat had done a good job of making the daylilies bloom well and normally. The first garden was that of Mrs. Beulah Stuteville, who had many of her own numbered seedlings in bloom, in addition to the new crop of seedlings and her collection of named varieties. There was a beautiful clump of her 'Peach Brocade', as well as her 'Summer Dream' and 'Red Tiger'. An especially promising seedling was S66-34 ('Flat Top' X 'Pres. Rice'), a flat, nicely shaped buff yellow; S66-339 was an eye-catching red. Plants of his R60-19 treated by Mr. Romine were growing in this garden, and they seemed to be tetraploid.

Mrs. Frances Kuhs was growing a number of varieties in large wooden tubs that could be shifted to take advantage of shade, the most spectacular being 'Raspberry Frills' (Williamson—1964) with its wonderful bright clean color and darker eye. Superbly grown also were 'July 4' (Wynne), an ryed red; 'Love That Pink' (Hall), a fine large pink of good shape; and 'Cherry Blossom' (Pittard), a very handsome darker pink.

Some of these same varieties appeared in the garden of Mrs. Donald McDonald, whose large collection left little room for her seedlings. Mrs. McDonald was testing a delightful group of sibling miniatures from Mrs. Olen W. Sheets of North Carolina, including 'Baron', 'Beth', and 'Thelma Griffin' ('Ringlets' x 'Fairy Wings'). The nicely shaped eyed 'Burlesque' (Lambert) was most attractive with its pie-crust edging. Another eye-catching variety from the same breeder was 'Trafalgar', a bright red which seemed to be enjoying the heat.

The Southern California Hemerocallis and Amaryllis Society had its annual daylily meeting at the Arboretum in Arcadia on June 17, with Mr. Robert J. Hixson, Jr., of Reedley, Calif., as the speaker. In the afternoon out-of-town visitors found much to look at in the Buck garden in Arcadia. Many tetraploid seedlings were at their height, and many named varieties were in good bloom. A colchicine-induced tetraploid form of 'Little Emily' (Hardy) attracted more attention than almost any other plant, perhaps because of the exciting possibilities it seemed to offer as a parent for tiny ruffled miniatures.

Now it can be reported that 'Tetra Little Emily' proved to be a very good pod parent and set many seed from a whole series of combinations

with pinks, lavenders, eyeds, melons. Another colchicine-treated parent was the strongly eyed 'Borgia' (Wynne); it proved to be fertile in some very interesting crosses. Treated plants of 'Lady of Northbrook', 'Lavender Parade', 'Cartwheels', 'Blue Jay', 'Grace Lenington', 'Shining Plumage', 'Pink Venus', 'Petite Pink', and many others contributed to giving a fairly adequate seed crop in spite of almost no seed from some normally heavy seed setters. Among the new Buck seedlings some lavenders and purples aroused the most interest and gave the best possibilities for both treating and breeding. Prospects for lavenders and pinks from the new seed crop seem much better after getting to study the 1967 seedlings.

'Bonnie Barbara Allen' was the most satisfactory of Dr. Virginia Peck's five 1966 tetraploid releases, none of which set any pods here. The flowers from the Peck clones most of the time seemed to resent our climate. By contrast, the beautiful Fay clones, 'Kathleen Elsie Randall', 'Lady Cynthia', and 'Gertrude Smith', bloomed very satisfactorily from plants set out at approximately the same time as the Peck varieties. 'Lady Cynthia' set the most pods this season, but all three set pods and had fertile pollen.

Dr. Hamilton P. Traub's work is now entirely with medium height plants or miniatures. Many interesting new seedlings bloomed in his garden, despite the erratic season. His 'White Cloud' was released in August, and Dr. Traub's insistence on sun-fastness should make it an important clone in tetraploid breeding. It was developed by complex selective breeding over a number of generations, including 'Tetra Duchess of Windsor', 'Tetra Winged Victory', 'Magdalena Luethi', some near white tetraploid seedlings, and others. It carries huge, wide open flowers which may have slight coloring on the margins on opening and in the sun changes quickly to a wholly light color which is still at its best by the end of the day.

Among the diploids blooming for the first time in the Buck garden this year was the exquisite 'Prairie Melody' (Marsh), 'Diamond Anniversary' (Childs), 'Childscraft' (Childs), 'Marty Simon' (Simon), 'Eburnean' (Munson), and 'Sleeping Beauty' (Munson) were particularly beautiful this year. The new clone 'Marguerite Lloyd' (Lloyd), which will be released as soon as stock is sufficient, besides being an extremely beautiful eyed variety, has proven to be the most everblooming thing in the whole garden. Two miniatures to warm the heart were the wonderful pink 'Dreamlet' (Childs), and the bright, dark lavender-purple 'Little Wart' (Spalding).

Even bad seasons do not keep us daylily growers from having some things to enjoy!

"STAMEN-EMBRACING PETEPALSEGS" HERITABLE DEFECT IN HEMEROCALLIS

Hamilton P. Traub

Those who are engaged in *Hemerocallis* breeding have encountered a heritable defect which disfigures the flower. When present, one, two or all three of the petepalsegs become stiffly erect, each affected one embracing a stamen. This heritable character has been named "stamen-embracing petepalsegs", and it may occur in diploids and tetraploids. It was not considered seriously, until the notorious example of it in 'Crestwood Luey' was encountered. In this example often most of its flowers are so disfigured. When used in breeding, the seedlings often inherit the defect.

The defect often occurs in seedlings with excellent color values which makes it necessary to try to eliminate it by crossing the defective plant with normal seedlings, and destroying that part of the progeny which shows the defect over a period of three or more generations.

It has not been determined if the defect is due to a single gene or to multiple genes. There is the puzzling situation in which the defect may disfigure part or all of a flower, part of the flowers or all the flowers on a scape. Sometimes all of the flowers are normal. It was also noted that plants which normally are not affected, sometimes may produce a flower or two which show the defect.

CHROMOSOME NUMBERS IN **HEMEROCALLIS WASHINGTONIA** "STATIC DWARF" PLANTS

Walter S. Flory and Ruth P. Phillips
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The basic chromosome number of *Hemerocallis* taxa is 11, with the cells of most species regularly having 22 somatic chromosomes, while the widely desseminated Europa daylily (*H. fulva*) has a 2n of 33 (Stout 1932; Chandler, 1940; etc.). Traub (1949; 1951; 1959-60) using colchicine on hybrid *Hemerocallis* diploids (2n = 22), induced allotetraploids (2n = 44). He named this colchicine-induced species *Hemerocallis washingtonia*. In additional work Traub found (1967) that among seedlings of the tetraploids there were three groups: (1) about 99% are normal growing plants which are cross-fertile, and more or less self-fertile; (2) less than 1% are normal growing but cross-sterile; and, (3) less than 1% are slow-growing, delayed-flowering dwarfs. Dr. Traub has supplied us with several dozen seedling plants of the third group—the slow-growing plants which he has termed "static dwarfs." The present note offers a preliminary report on the somatic chromosome numbers encountered in root-tip cells of some of these dwarf plants.

OBSERVATIONS

In 1966 somatic chromosome counts were made or attempted with a number of plants. Exact numbers, or exact ranges of numbers, from

these studies are presented for 9 plants, in Table 1. It may be noted that apparently one plant had 38, one plant had 44, 2 plants had 40, 3 plants had 42, and 2 plants had from 38 to 42 somatic chromosomes. As the study proceeded, however, it became increasingly evident that the number of chromosomes per plant probably fell within a definite range, rather than usually being an exact number. Accordingly, it was determined that in future studies attempts would be made to secure numbers, where possible, from a larger number of cells per plant.

Table 1. Chromosome numbers in some dwarf seedlings of **Hemerocallis washingtonia**, 1966.

Seedling number	2n	Seedling number	2n
H-1	42	H-7	44
H-2	40	H-9	40
H-4	38	H-12	42
H-5	38-42	H-13	42
H-6	38-42		

In Table 2 the data secured on 16 additional plants in 1967 are arranged. One of the plants (H-7) studied in 1966 was also restudied (Table 2). With the 17 plants analyzed in 1967 the chromosome numbers 40 and 42 were encountered most frequently. In one plant 36, and in another 38, were the most frequent numbers observed. In one plant 46 seemed to be the predominating number, while the euploid number 44 was most often encountered in 3 plants. Lower numbers were encountered in single cells in several cases.

DISCUSSION

It is clear from the data that in most cells, and plants, there has been a loss of from two to six chromosomes. Most often there has been a loss of either two or of four chromosomes. Very occasionally there is the gain of a pair of chromosomes. Also, it seems apparent that the range of chromosome numbers from cell to cell, within a given individual is greater here than is usually encountered in species.

The Notes column of Table 2 indicates that complete cells with 21, 22 and 23 chromosomes were observed. In one case what clearly appeared to be a complete cell, with wall intact, just as clearly showed only 7 chromosomes. Unprovable suppositions accounting for such numbers may be made. The 21, 22 and 23 chromosome numbers approximate the diploid number for the genus, and may represent a breakdown from the induced tetraploid, to the original diploid, number. In the second case perhaps a tetraploid ($2n = 44$) cell divided 37 and 7, with the $2n = 7$ cell not being immediately lost, but surviving for one or more cell generations.

There is considerable difference in vigor among the various static dwarf plants. So far we have not been able to correlate this with any specific chromosome number. It is possible that the loss of certain chromosomes—and genes—affects vigor and adaptability more than the loss of others. It also seems likely that where one, or a few, chromosomes are lost that these are not always the same ones.

Table 2. Chromosome numbers in some dwarf seedlings of **Hemerocallis washingtonia**, 1967.

Seedling number	2n usual	2n range	Cells counted	Notes (Nos.: 1st no. of cells: 2nd—2n)
H201	38	36-43	8	3, **38**; 2, **36**; 1 each **37**, **42**, **43**
H202	40	40-46	30	10, **40**; 6, **42**; 6, **43**; 5, **44**; 1, **45**; 2, **46** (also 1 each: **21**; **22**; **23**)
H203	40	40-42	7	6, **40**; 1, **42**
H204	44	36-44	7	3, **44**; 1 each **36**; **38**; **42**; **43**
H205		40-44	2	1 each **40**; **44** (also 1, apparently complete, ?)
H206	36	34-42	11	4, **36**; 3, **34**; 1 each **38**; **40**; **41**; **42**
H208	42	40-43	5	3, **42**; 1 each **40**; **43**
H209	44		1	1, **44**
H210	44	40-44	6	3, **44**; 2, **42**; 1, **40**
H211	42	40-41	4	2, **42**; 1 each **40**; **44**
H213	42	40-42	5	3, **42**; 2, **40**
H214	40, 42	38-44	8	3, **40**; 3, **42**; 1 each **38**; **44**
H215	40		1	1, **40**
H216	40, 42	40-42	2	1, **40**; 1, **42**; (+1, **22**)
H218	42	42-44	7	4, **42**; 3, **44**
H220	40	36-44	14	5, **40**; 4, **44**; 3, **42**; 2, **36**
H7	46	44-46	6	3, **46**; 2, **44**; 1, **45**

The loss, or gain, of chromosomes—and perhaps of particular chromosomes, would seem—plausibly—to be ultimately responsible for the abnormal growth habits of the plants studied. It seems clear that the analysis of other plants, as well as the more careful study of some of the plants already dealt with, offers the promise of throwing additional light on the factors involved. Such work is planned.

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4. AMARYLLID CULTURE

REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.

1967 LYCORIS REPORT

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Developments are slow in the lycoris world. Since my last report, for 1964 (Plant Life 1965), I have continued to maintain a large collection of these bulb flowers and have kept at my hybridizing efforts. Bloom seasons have brought exciting moments and disappointments. Erratic performances by some of the species have left me befuddled at times. But I find altogether fascinating the strange growth habits and sometimes sensationally beautiful flowers.

Insofar as flower production is concerned, "good" and "bad" lycoris seasons have alternated here for the past four years. 1964 and 1966 brought very fine floral displays. In 1965 there were fewer scapes but still enough to sustain interest. The past season—1967—has been most baffling. Bloom was light on most species and failed entirely on *L. caldwellii*, *L. chinensis* and *L. haywardii*. There was one scape instead of the usual dozens on *L. sprengeri*. On the other hand, *L.* x *jacksoniana* bloomed fairly well and the fertile *radiatas* came in great profusion.

Normally a poor lycoris season in this area follows a severe winter, but it was not so this time. Our last winter was relatively mild. We did, however, have a cool, rainy summer which kept grass and trees beautifully green and most flowers in fine condition. Apparently this was not to the liking of some of the lycoris bulbs which need an early summer drying-off period to trigger their bloom mechanism.

BLOOM CHART

A bloom chart showing dates and duration of bloom on various lycorises has been one of my projects for a long time. Ideally it would be based on data recorded over ten or more years on plantings which include a substantial number of bulbs of each species.

The accompanying chart falls short of my ideal—it simply shows bloom as it occurred during one good year, 1966, in my own Middle Tennessee area. It does not give a true picture of bloom duration on all kinds. Some of the rare sorts are represented by only two or three bulbs, while the *squamigeras* and *radiatas* grow by the hundreds in several different locations; naturally there is bloom for a longer time on the latter.

Each line on the chart following a named species extends from the date that species had its first fully developed scape, with all flowers in the umbel open, to the date when the last scape began to fade. Regrettably, I have not kept detailed records on blooming dates through many other years. But fragmentary notes show that blooming seasons of a given species may vary from year to year by two weeks or more from the dates shown for 1966. Correspondence with other growers indicates, as might be expected, that farther south, blooms come earlier.

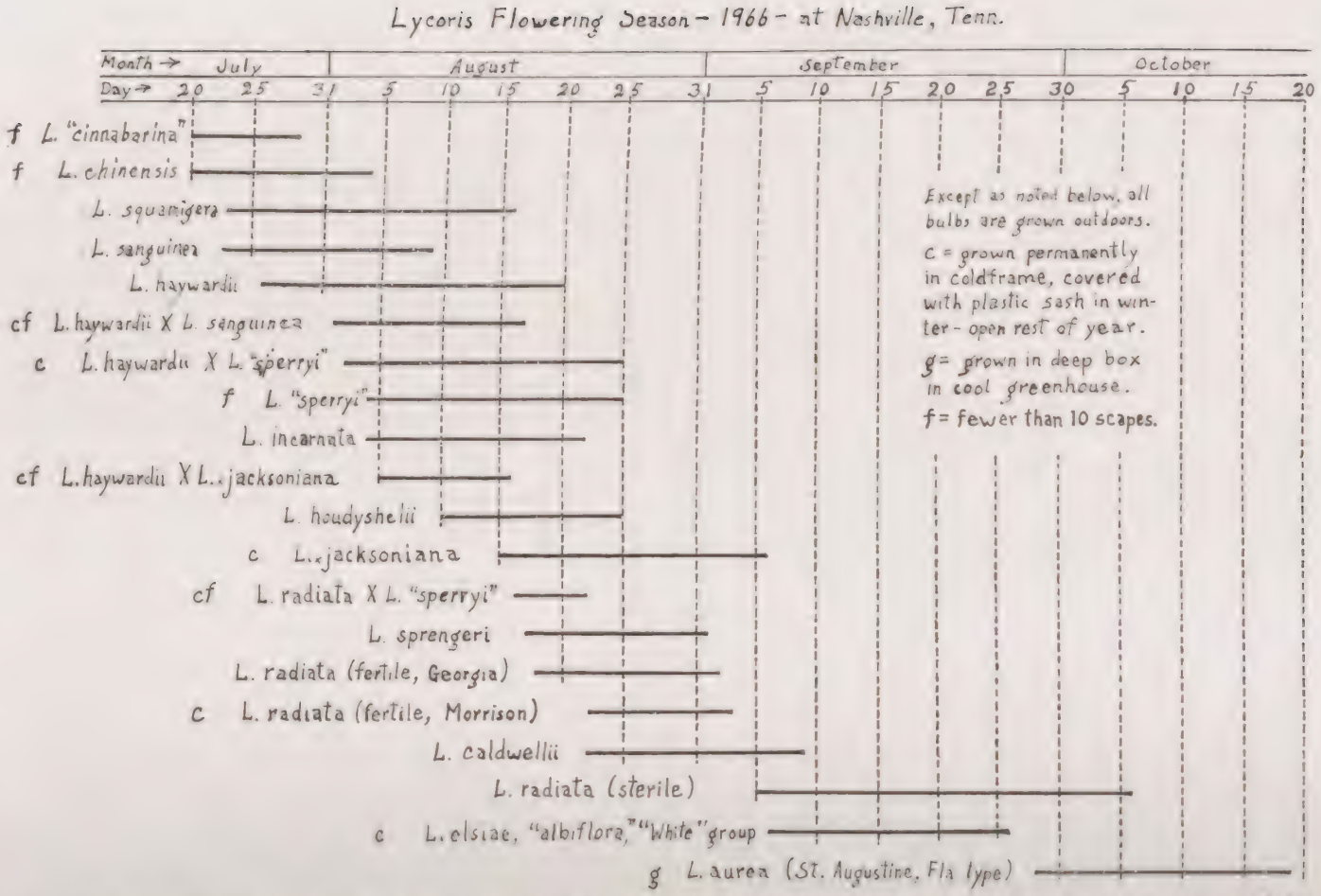
Lycoris Flowering Season – 1966 – at Nashville, Tenn.
Month → July August September October
Day → 20 25 31 5 10 15 20 25 31 5 10 15 20 25 30 5 10 15 20
f L. "cinnabarina"
f L. chinensis
L. squamigera
L. sanguinea
L. haywardii
cf L. haywardii X L. sanguinea
c L. haywardii X L. "sperryi"
f L. "sperryi"
L. incarnata
cf L. haywardii X L. jacksoniana
L. houdyshelii
c L. jacksoniana
cf L. radiata X L. "sperryi"
L. sprengeri
L. radiata (fertile, Georgia)
c L. radiata (fertile, Morrison)
L. caldwellii
L. radiata (sterile)
c L. elsiae, "albiflora," "White" group
g L. aurea (St. Augustine, Fla type)
Except as noted below, all bulbs are grown outdoors.
c = grown permanently in coldframe, covered with plastic sash in winter – open rest of year.
g = grown in deep box in cool greenhouse.
f = fewer than 10 scapes.

Fig. 20. Lycoris blooming chart showing dates and duration of flowering period for various Lycoris species and hybrids at Nashville, Tenn. in 1966. See text for further explanation.

With all of these qualifications, the chart will prove of interest, I hope—especially in showing that it is possible to have lycorises blooming continuously through two and a half months.

HYBRIDS

L. x *jacksoniana*, the *sprengeri-radiata* cross that first flowered in 1961, continues to be best of a number of hybrids that have now bloomed. Light pink through many rosy shades to deep purple-red in different individuals, these bulbs bring a new look to the lycoris genus. They flower well and bulb increase is good. Neither parent is a large lycoris, and so these hybrids are of modest size, but their color is wonderful.

As previously reported, one fault is the susceptibility of their fall produced foliage to cold weather injury. I have to grow them permanently in large coldframes which are covered with plastic sash in winter. Outdoor trial plantings in northern Mississippi and southward, however, appear to be performing satisfactorily.

From a cross of *L. radiata* by *L. haywardii* made in 1959, I have five bulbs. Two of them bloomed for the first time in 1967. The nearly identical scapes were at peak stage on July 20, 16 inches tall, with umbels 6½ to 7 inches across, one having six and the other seven flowers. Color was a soft medium rose, with violet streaks from segment tips inward. Actually, these could be mistaken for *L.* x *jacksoniana;* they bloomed, however, about two weeks before any of my *jacksoniana* bulbs.

In 1961 I used *jacksoniana* pollen on *L. haywardii* flowers. Of several resulting seedlings, one flowered in August, 1966 and another in '67. These were my first hybrids combining three different species—*L. sprengeri, L. radiata* and *L. haywardii*. While pretty, these were a bit disappointing in that, except for a litte stronger bluish-violet tinting, they, too, looked just like some of the *jacksonianas*.

More exciting was a 1967 scape of *L.* x *jacksoniana* crossed back on one of its own parents, *L. sprengeri*. Flower form was similar to *jacksoniana* but coloring was unique—very pale pasted tints of salmon and lavender. I will watch with special interest additional bulbs of this cross and of *jacksoniana* crossed with the other parent, *L. radiata*. There is much difference in foliage of these seedling bulbs, and flowers may be equally varied.

My 1964 report included descriptions and pictures of first bloom on the *L. haywardii—L.* "Sperryi" and *L. haywardii—L. sanguinea* crosses. Since then a number of additional seedlings of each cross have bloomed, but with no significant variations from the first flowers.

The 1964 report also carried a picture and notes on a cross of *L. radiata* and *L. chinensis* made by Dr. John Creech. In 1959 I used pollen of the big hardy yellow *L.* "Sperryi," which is similar to *L. chinensis*, on *L. radiata*, and got about a dozen seedlings started. One of these bloomed in August, 1966 and another this year. Not surprisingly, they are much like the Creech hybrid—"spiderlily" form and very soft yellow coloring. Aging flowers acquire pinkish tints. These are

extremely pretty flowers. Thus far I have not been able to get seed on them or on the Creech hybrid, which has bloomed again. Most of the other hybrids seed freely, and I have small bulbs of many new crosses coming along.

NEW ACQUISITIONS

The late B. Y. Morrison, Pass Christian, Mississippi, used to buy "white" lycorises in quantity—100 bulbs at a time—from dealers listing them as "Albiflora," "Radiata alba," "Albiflora carnea" and the like. Many of these turned out to be the pastel tinted *L. elsiae*, but there were usually variants in each lot. He delighted in watching the bloom for distinctive and superior individuals, and he sent a number of these along to me. The last ones came in 1964, labeled "L. albiflora Light Rose Pink." A letter explained that these had shown up in a shipment of "Albiflora" bulbs from the Walter Guille wholesale bulb dealers, Long Island, N. Y., and he thought they were an outstanding "find."

I was happy to concur in his judgment when a beautiful scape of silvery-pink flowers appeared in early September, 1966. Foliage and growth habits are like others in the big, confusing "Albiflora" group; it is the color that is unusual. Incidentally, in Plant Life 1964, Mr. William Lanier Hunt, Chapel Hill, N. C., reported finding in 1962 a new porcelain pink lycoris in a shipment of *L. elsiae* bulbs. My guess is that when we are able to compare these two, we shall find them identical. We have needed a pink lycoris of this type, and it is good to know that one does exist.

For several years Mr. James Giridlian has been offering a "Lycoris cinnibarinum" in his Oakhurst Gardens catalog. Thinking they must be the same as "L. cinnabarina" bulbs I already grew, I haven't ordered any. This year a young lycoris enthusiast, Philip Adams, of Marks, Mississippi, sent me one of several "cinnibarinum" bulbs he had from Oakhurst, and reported that he had flowered one on August 20 at his home in northwest Mississippi. Foliage, he said, is like that of *L. traubii*. The 17-inch scape carried seven flowers, making an umbel 8 inches across. In form the flowers are much like *L. incarnata* but color is a blend of light mandarin orange-red with strong suffusions of deep gold-yellow, strongest along center of segments. General effect from a distance is a warm apricot color.

I have flowered "L. cinnabarina" a few times, and it is clearly related to the early blooming, orange-red *L. sanguinea*. This new "cinnibarinum" has a different foliage habit and a different bloom season. As I viewed it in Mr. Adams' color slides, it appears to be quite distinctive—perhaps an entirely new species.

In July, 1965, Dr. Traub sent me two bulbs of the newly named *L. josephinae*. One bloomed in September of this year. It is a beautiful lycoris but in this locality it seems to be identical to the widely grown triploid form of *L. radiata*, which blooms at the same time. I cannot tell them apart either in flower or foliage.

UNSTABLE COLOR IN L. HOUDYSHELII

Since original publication of its name (Plant Life 1957) *L. houdyshelii* has been described as a "white" lycoris. Bulbs had been received from China in 1948 by Mr. Wyndham Hayward as "L. alba," indicating that the Chinese considered it white. My own early notes, based on observation of the first few scapes that appeared, state, "flowers open with a cream-white tint and then turn clear white; pistils are white, tipped pink, and the anthers carry yellow pollen." Color photographs made at the time confirm the description. Mr. Hayward wrote, "it is clear milky white, almost an oyster white, with sparkling brilliance in full sunlight."

There was no reason to suspect that those blooms in the early 1950's were other than typical. However, with additional observation of this species we learn that under some conditions the flowers are substantially suffused with pink. A bulb that I sent to Mr. B. Y. Morrison flowered with so much pink evident that he thought it was a mutation from the original type. Miss Edna Spalding, noted daylily breeder of Iowa, Louisiana, sent me a color slide showing bloom on a bulb I had supplied, and it was decidedly pink flushed. In 1964 I moved some of my bulbs from a garden location into a protected coldframe, facing south. Eleven fine scapes appeared in 1966, with flowers opening a rich cream and within a day beginning to show blush and pink suffusions which gradually deepened. Meanwhile, other bulbs remaining at the earlier location under a dogwood tree, had white blooms. And Mrs. U. B. Evans wrote from Ferriday, Louisiana that her *houdyshelii* was white.

The pink markings, as I have seen them, follow no set pattern but develop irregularly as faint to deep rosy tints over the creamy segments. Filaments and styles turn pink on the upper side only, remaining white underneath. I noted this color change in aging flowers of *L. houdyshelii* in the 1957 published description, but it appears now that the pinkish marks are sometimes present almost from the opening.

I feel sure that there has been no genetic change in the bulbs. Light, temperature, moisture, soil or other environmental factors apparently affect the color. Pink suffusions make the flowers no less beautiful; indeed, some think the pinkish blooms are prettier. But this information about the coloring should be publicized; otherwise people acquiring the supposedly white lycoris may be disappointed.

After observing *L. houdyshelii* flowering most years since 1951, it seems to me that the basic color is cream-white; certainly that is the way it opens. Under different conditions it may become quite snowy or definitely rosy. In any event it remains one of the most beautiful species known in cultivation. I only wish the bulbs multiplied faster.

Somehow, discovery of this changeable characteristic in one of my favorite lycorises reminds me of the slightly ribald description of a young coed I heard away back in college days: "She was pure as the snow but she drifted."

MISCELLANEOUS NOTES

In the 1964 Plant Life, I wrote of "A New Yellow—Perhaps." This concerned bulbs from Japan distributed in this country in the fall of 1962 by at least one large wholesaler, under the label, "New Import —Hardy Golden Spiderlily." The wooden bulb cases were stenciled, "L. aurea" and "Grown in Japan." Enticed by an attached color picture and the "Hardy" claim, I bought an entire case—some 700 bulbs about 1⅝ inches in diameter. I planted over 500 of them for myself and in good faith sent out small trial lots to friends all over the country. Now it can be told that the whole deal was a hoax. About 5% of the bulbs proved to be *L. traubii*, which is yellow but far from hardy. The rest were just half-grown bulbs of common *L. squamigera*.

I still occasionally see "Hardy Yellow Spiderlilies" offered on plant counters of some of the variety stores. Bulbs appear to be *L. traubii*—a good lycoris but hardy only in Mid-South and milder areas.

Another batch of bulbs bought as "L. purpurea" has bloomed for me, and as always in the past, they turned out to be *L. sprengeri*.

Growing hundreds of seedling lycoris bulbs in ground beds (coldframes), I have a tedious weeding problem. New herbicides which inhibit the germination of seeds in the surface layer of soil are proving helpful. Treflan and Dymid (Elanco Products Co., Indianapolis, Ind.) are giving complete control of nuisance grasses and of many weeds, though there are certain winter weeds and an oxalis species still troublesome. Nurserymen and other commercial plantsmen currently use many chemical weed controls. Used with proper precautions, some of these are real labor savers for bulb growers.

AGAPANTHUS AFRICANUS VAR. HENRYAE

Mary G. Henry, *Gladwyne, Penna.*

Agapanthus africanus has been living out of doors at Gladwyne, Pennsylvania for over 25 years. Always it gives me its exquisite blue flowers just at a time when I need them most, for they are at their lovely best in mid to late July. This is usually a season when our spirits are somewhat bedraggled by the intensest heat of summer.

Mostly all our winters have some days of sub-zero temperatures and sometimes the ground freezes deeply. Once in a while, when I happen to think of it, I place a few evergreen boughs over them. Many winters they have had no protection whatsoever. Their situation with a photo was described in HERBERTIA 1961.

It was in 1960 that the idea came to me to try and raise some seedlings in order to see if I could get some improved ones. So on October 30, 1960, I gathered some plump seeds and planted them in a seed box, 12 inches by 24 inches and about 5 inches deep. The seeds germinated fairly promptly and the box was wintered in a sunny glassed in porch

Fig. 21. **Agapanthus africanus** var. **henryae** Traub, as grown in a 6-inch pot at Gladwyne, Penna.

that had sufficient heat to keep the temperature above freezing. The following summer the box was placed outside in nearly full sun.

When the seedlings were two years of age, five of them flowered and one of them bore a beautiful head of pure white flowers. This one was removed from the seed box and I potted it separately in rich soil. It grew apace, and I was able to distribute it as follows:

On May 16, 1963, I sent several divisions to Dr. Hamilton P. Traub, La Jolla, California, who described and named it *Agapanthus africanus* var. *henryae*.

On April 1, 1964, I took and gave to Callaway Gardens, Pine Mountain, Georgia, a blooming sized plant.

On September 28, 1964, I sent several more divisions to the late Dr. Ira Nelson, Louisiana Society for Horticultural Research, Lafayette, La.

Last winter 1965-66, I was brave enough to plant out of doors in a permanent position, twenty-eight seedlings of *A. africanus*, including the white *A. africanus* var. *henryae*. This was done late in the year, October, which was not too favorable a time to plant them.

However, I had a carefully prepared bed made. It was dug about 1 foot deep and the soil was well mixed with $\frac{3}{4}$ inch crushed road stone and peat called "Maryland Peat", the latter from near Betterton, Maryland. The bed is surrounded by rather large, naturally placed boulders. They are shaded in summer for about a quarter of the day by old, deciduous trees. Dr. Walter Hodge, on a recent visit, said that they were native in just such a situation in Africa, which I had surmised.

Everyone survived the winter and came up well in the summer of 1966. Even the small plant of *A. africanus henryae*, freshly removed from the original pot, survived and made two flowering stalks, this past summer.

Not only as a pot plant, but also as an out of doors garden plant for a choice situation from Pennsylvania and Long Island southwards. *A. africanus henryae* has a bright and useful future ahead of it in our gardens. The accompanying photograph, depicting eleven spikes of flowers, shows its vigor in spite of the many pieces removed from it during its short life.

The remainder of the seedlings, twenty-eight blues, will be tested for form, size of flower and hardiness.

It has been an interesting adventure in breeding and I feel the reward for the time and trouble has been very great.

Aug. 30, 1966,
Gladwyne, Penna.

PLANT LIFE LIBRARY—continued from page 62.

THE NATURE OF BIOCHEMISTRY, by Ernest Baldwin. Cambridge Univ. Press, 32 E. 57th St., New York, N. Y. 10022. 1967. Pp. 111. Illus. Cloth, $3.50; paper, $1.65. This stimulating text is meant to be read rather than studied as an introductory course in biochemistry for high school and university students. The subject matter is concerned with the constancy of the internal environment, the function of the blood, proteins, enzymes, amino acid and nitrogen, carbohydrates, fat, the power-house of the cell, nucleic acids and nucleoproteins. Highly recommended.

A DICTIONARY OF THE FLOWERING PLANTS AND FERNS, by J. C. Willis, 7th Edition, revised by H. K. Airy Shaw. Cambridge Univ. Press, 32 E. 57th St., New York, N. Y. 10022. 1967. Pp. xxii; 1214; liii. $18.50. This 7th edition of Wills' Dictionary has been thoroughly revised. In order to achieve a moderate-sized volume, some matter that is dealt with more suitably in other works has been omitted. The main body of the book is devoted to a dictionary of the genera, families, orders and groups of higher rank of flowering plants and ferns arranged alphabetically. This is followed by a key to the families of flowering plants; a synopsis of the system Bentham & Hooker, 1862-93, and an index to the orders and groups of higher ranks. Highly recommended to all plant scientists.

TAXONOMY OF FLOWERING PLANTS, by C. L. Porter. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 2nd Edition. 1967. Pp. 472. Illus. 399. $7.75. This text on the basic principles of taxonomy is intended as a beginning course. The subject is reinforced with illustrated descriptions of more than a hundred families of flowering plants. Highly recommended.

SOURCEBOOK OF LABORATORY EXERCISES IN PLANT PATHOLOGY, by Arthur Kelman, et al. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1967. Pp. 387. Illus. $8.50. Prepared by the American Phytopathological Society Sourcebook Committee, this book includes 227 exercises based on major subjects.-(a) principles of plant pathology; (2) physiological processes or functions affected; (c) biotic causes of diseases; and (d) types of crops affected. This book is indispensable for all teachers and students in plant pathology. Highly recommended.

PLANTS AS ORGANISMS, by Robert M. Page. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1967. Pp. 87. Illus. 10. Paper bound manual, $2.75; individual studies, 20 cents each. The objective of the 18 exercises in this course is to present the beginning student with opportunities to acquire factual information about the structure, functioning and reproduction of green plants and fungi; and to encourage the student to develop useful skills and an attitude of inquiry. Highly recommended.

SYSTEMATIC EMBYOLOGY OF THE ANGIOSPERMS, by Gwenda L. Davis. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1966. Pp. 528. $19.75. This book breaks new ground in bringing together those details of angiosperm reproduction which are not generally known. The introduction is concerned with (a) systematic and taxonomic characters, (b) taxonomic evaluation of embryological characters, (d) the anther, and (e) the ovule. The main body of the text is concerned with the embryological details of the plant families. The monumental bibliography of 215 pages on plant embryology alone is worth the price of the book. Highly recommended.

GENERAL VIROLOGY, 2nd Edition, by S. E. Luria and J. E. Darnell, Jr. John Wiley & Sons, 605 3rd Av., New York, N. Y. 10016. 1967. Pp. 512. Illus. $12.50. This second edition of a widely used text by outstanding authorities will be welcomed by all biologists. The introductory part outlines the basic measurements, physical, chemical and biological techniques necessary for the presentation of virology as a modern biological subject. The main body of the text is devoted to discussion of the accumulated knowledge on viruses, particularly bacteriophage physiology, and the biochemistry of animal virus multiplication. This new edition belongs in the library of all biologists. Very highly recommended.

Fig. 22. Bouquet of bright Amaryllis blooms carried by the Maid of Honor at the Costa Mesa, Calif. spring wedding in 1967. Photo by Turville Studio, Santa Ana, Calif.

AMARYLLIS BLOOMS APPROPRIATELY USED AT A WEDDING

W. Quinn Buck

At a beautiful early spring wedding in Costa Mesa, Calif., Chadwick Gardens, Redondo Beach florists, used their fine white amaryllis very effectively for the decorations of the church as well as for the bouquets of the bridesmaids. Our picture (Fig. 23) shows the bride under a large arch of the hugh amaryllis. The other picture shows the bouquet (Fig. 22) carried by the maid of honor.

Chadwick Gardens has found that by allowing the first bud on a spike to open in the greenhouse, the pot can then be stored for as long as three weeks in their cold room; the other buds will then open normally in the greenhouse, allowing for the use of large numbers of flowers at one time. Some of the exhibitors at amaryllis shows might be able to take advantage of this if they have access to a cold storage room.

Fig. 23. The bride under the large arch of brilliant **Amaryllis** blooms at the Costa Mesa, Calif., spring wedding in 1967. Photo by Turville Studio, Santa Ana, Calif.

AMARYLLIS REGINAE AND CRINUM ERUBESCENS

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In 1964 we made a trip through Peru, where we collected a bulb or two from every group of amaryllis we found in the areas of Huanaco, Tinga Maria, Tournavista and down the Rio Huallaga (and some of its tributaries) toward Terapoto. Most of these bulbs were not in bloom when collected.

One of these bulbs bloomed in early 1966. The scape, just as the first flower was starting to open, was cut, along with one mature leaf, and packed in a long cardboard box. Crumpled tissue paper was placed around the scape and the flower to support them during transit. These were sent to Dr. H. P. Traub for identification, who wrote: ". . . is the finest type of *Amaryllis reginae L.* that I have seen, and it would be worthwhile to propagate it since many others would be pleased to have it in their collections". We selfed it and from about forty flowers obtained nearly a thousand seed, which were distributed in the United States.

In a swamp area about five miles east of Tinga Maria, growing near the banks of the Rio Huallaga, was found *Crinum erubescens*. The plant has channelled foliage (typical of the Americanum Alliance) and is stoloniferous, and usually has seven white reflexing flowers which open all at once. It loses its foliage at 32° but has grown vigorously and flowers regularly in Burbank, California.

NOTES ON WORSLEYA RAYNERI (BLUE AMARYLLIS)

Beckwith D. Smith
2036 Post Street, Jacksonville, Florida 32204

My association with *Worsleya rayneri* (Syn. *Amaryllis procera*), the "BLUE AMARYLLIS", actually began taking shape in 1940 when I read the article by Harry Blossfeld in Herbertia on his successfully collecting bulbs of this rare plant from the slopes of the Organ Mountains in Brazil, followed by another article by E. J. Anderson in connection with growing the plant in the West Palm Beach, Florida area. In the 1942 issue of Herbertia, there was another article on growing the "BLUE AMARYLLIS" in California. In the 1966 issue of Herbertia there was a follow-up article by Mr. Blossfeld which was most illuminative on the natural habitat and growing conditions, and further enhanced by most provocative illustrations of these magnificent plants growing, blooming and seeding on the mountainside. In the 1967 issue of Herbertia, Mr. Burr Clouette of Columbia, South Carolina showed a picture of his "BLUE AMARYLLIS" growing from seed.

At this juncture my nebulous dream of owning one or more of the bulbs became an obsession, and I began trying to locate a source from which I might procure some as soon as possible. I found a source of

supply soon thereafter in Charles L. Harris of Griffin, Georgia, who informed me that he was importing a supply of the bulbs from Brazil. I made arrangements with Mr. Harris in February and March of 1967 to receive eight plants. After feverishly waiting for my bulbs all through April and May, I was finally rewarded by the bus depot calling me one Sunday morning in June saying that a carton of flower bulbs had arrived for me. I immediately went down and obtained my shipment. The bulbs were in excellent condition.

Fig. 24. The Blue Amaryllis, **Worsleya rayneri** bulbs in pots in the garden of Mr. Beckwith D. Smith, Jacksonville, Florida.

I made a mental note: "Happiness is having a BLUE AMARYLLIS!!" And up to the present, indeed it has turned out to be so. All during the period of waiting for the bulbs to arrive I had been reading everything I could lay hands on about the cultivation of this most rare Amaryllis, had prepared my soil, filling extra large pots and watering them copiously to be sure the mixture would drain properly. Upon opening the carton the big bulbs were found to have only a few stubs of roots on some, and on others no roots at all. The bulbs can best be described as "club shaped". There is no definition of neck from basal plate, the basal plate being from three to five inches thick, immediately

joining the base of the bulb; and counting from the bottom of the basal plate to the upper end of the neck, where the leaves emerged, they averaged from 36 inches to 48 inches in length. Six bulbs had a curved neck, and two were almost straight. The leaves are glaucous, approximately 2 inches wide, and with a very narrow reddish strip on each edge. Lifting up the top leaf one finds another shorter leaf underneath, and lifting up this leaf there is another shorter leaf, so that finally the shortest leaf is only just coming out of the center of the neck. Their weight is approximately 5 pounds per bulb. A potting soil mixture was made of granulated peat, sphagnum moss, some clean sand and a little bit of rotted dairy manure. The bulbs were set in this with the basal plate just under the surface of the soil. Stakes were attached to each bulb to hold them upright.

This record is being written in August, 1967, so the BLUE AMARYLLIS have been planted for two months. Each day the pots are flooded with water, which slowly but surely drains away, and it is easy to see that the bulbs are making good leaf growth, all but two, and these seem reluctant to make a start, but perhaps they will in time. Also, these slow fellows are shorter in stature than the others. I only hope they are making a root growth. When winter comes, I may have to transfer them to a large flat container in the greenhouse, and apply bottom heat through the use of soil heating cable with thermostat. But if they make root and leaf growth prior to cold weather, it may be they will be content just to be moved inside the greenhouse. Figure 24 shows three of the BLUE AMARYLLIS, placed in pots and set in the center of the garden in order to get a good picture, but they regularly stay just at the edge of a Chinese Elm tree to get the morning sun, and thereafter be lightly shaded for the balance of the day. Here they receive ample humidity and good air circulation and I am humbly and prayerfully waiting for their blooming, and this will be a happiness which I will endeavor to share with all who want to see them at that time. Color pictures will also be taken. The bulbs I have are reported to be more than fifteen years old. Every attempt will be made to successfully grow them and a future report as to success or failure will be made.

ASEXUAL PROPAGATION OF **LYCORIS SQUAMIGERA** MAXIM.

EDWARD G. CORBETT [1]

In an earlier report on asexual propagation of *Lycoris*, preliminary results of a greenhouse experiment with the techniques frequently used in the propagation of *Amaryllis* and *Narcissus* were reported for *L. radiata* and *L. sanguinea* (1). Since that experiment was conducted in a greenhouse, a second experiment was set up to test the most promising techniques under field conditions.

The earlier experiment had indicated that rotting of the bulbs after cutting might be a serious drawback, especially in the field where the

[1] Research Horticulturist, Crops Research Division, Agriculture Research Service, U. S. Department of Agriculture, Glenn Dale, Maryland.

dangers of infection would probably be much greater. It was felt, therefore, that the amount of rotting that might be expected should be determined under field conditions. The need to study the efficacy of these propagation techniques on other species of *Lycoris* was also considered in setting up this experiment.

MATERIALS AND METHODS

Bulbs of *Lycoris squamigera* Maxim., which produce its leaves in the spring, were dug on June 14, 1965 and allowed to dry over night. The bulbs were then graded by size and prorated to each treatment to assure a reasonably even distribution of sizes in each treatment. The treatments were: cross-cutting the basal plate into 4 equal segments about two-thirds of the depth of the plate, sectioning the bulbs into halves, and no treatment. The bulbs were dusted on the cut surfaces or basal plate with a 2:1 mixture of Hormodin #1 and Fermate. The dusted bulbs were allowed to dry for 2 days to promote suberization of the wounded surfaces and then planted about 4 inches deep in sand in a cold frame. The sand was construction grade. The bed received no supplemental irrigation during the experiment. Records were maintained at intervals on the appearance, growth, and senescence of the leaves. The bulbs were removed from the cold frame on June 8, 1966 and the results tabulated.

In order to further evaluate the treatments, 75 bulbs from each of the 2 wounding treatments were measured with a Vernier Caliper. A single measurement in the plane with the greatest diameter was made on each bulb and the results were tabulated. Length of the bulb was not determined, because this measurement appeared to be more closely related to depth of planting than to any other factor.

RESULTS

The number of young bulbs produced and the number of propagules which rotted are shown in Table I. As noted in the earlier experiment, there is a very marked increase in bulb production when the basal plate is cut. As had also been shown earlier, sectioning the bulbs gave a much greater degree of rotting such that the total yield of bulbs was reduced in comparison with simply cutting into the basal plate. However, rotting of the propagules was not a particularly serious problem in the field experiment.

The leaves began to push above the ground early in March at approximately the same time that the leaves were appearing on other nearby plantings of *L. squamigera*. There appeared to be no striking difference in the leaves other than their smaller size, although failure of some leaves to appear did serve as an indicator of the losses to rot. The leaves were starting to die at the tips on May 17 and were almost completely dried by June 1, somewhat ahead of the other *L. squamigera* plantings. The early senescence of the leaves can probably be attributed to the low fertility and relative aridity in the sand bed.

Table I. Results obtained from propagation treatments with bulbs of **L. squamigera.**

Treatment	No. of Bulbs	Propagules	Propagules Rotted	Propagations	Percent Increase of Bulbs
No treatment	22	22	0	23	4.6
Basal Plate Cut	21	21	0	110	523.8
Sectioned ½	21	42	12	83	395.5

Table II. Relative sizes of new bulbs produced by cutting the basal plate or sectioning the bulbs of **L. squamigera.**

Treatment	Diameter (mm)			Size Classes						
	Least	Greatest	Average	5-10	10-15	15-20	20-25	25-30	30-35	35-40
Basal Plate Cut	12.7	36.8	23.6	0	7	16	21	19	9	3
Sectioned ½	8.2	33.2	19.7	1	11	32	19	8	4	0

The relative sizes of the bulbs produced by wounding are shown in Table II. It can be readily seen that cutting the basal plate produced larger bulbs than sectioning. The average size of the bulbs produced by cutting the basal plate was almost 4 mm greater than that of the bulbs produced by the sectioned propagules. The smallest and greatest diameters noted on the bulbs from the basal plate cut treatment were larger than the corresponding measurements obtained on the bulbs resulting from sectioning. When the bulbs are placed in size classes, a very definite shift to larger sized bulbs with the basal cut treatment can be seen.

The results reported here show quite clearly that *L. squamigera* can be easily propagated by cutting the basal plate and setting the bulbs in a sand bed in the open. An increase of 5 to 1, with no evidence of rotting, as well as bulbs that are larger than the other treatment tested, offers a great potential for the rapid increase of this plant.

Further experiments on fertilization of the plants in the propagating bed, timing of treatments, response of other species to the treatments, and methods of reducing rotting will be made as time, space, and supply of bulbs permit.

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VERTICAL BULB CUTTAGE IN NERINE

Hamilton P. Traub

In the case of the two clones of *Nerine* x *traubianthe* Moldk., one a cross of *Nerine filifolia* x 'Rosabla', multiplies rather rapidly by producing bulb offsets so that it was possible to send some of these to others interested in hybrid nerines. However, the cross, *Nerine filifolia* x 'Inchmery Kate' gave a clone with a rather thick scape, and which produced no offsets. In order to distribute this clone, it was necessary to

resort to vertical bulb cuttage (see summary, Traub, 1958). Bulbs are cut vertically into quarters and these are planted in coarse sand, kept watered until sprouts appear, when they are planted in a suitable soil mixture. As a preliminary experiment one bulb of each of the clones was cut vertically into quarters and the results are summarized in Table 1.

Table 1. Results from vertical bulb cuttage in hybrid **Nerine.** Bulbs cut November 1966; data taken August 15, 1967.

Clone	number of bulbs cut	number of vertical bulb cuttings	Number of new bulblets	Remarks
Nerine filifolia x 'Rosalba'	1	1	1	
		1	1	
		1	1	
		1	1	
Nerine filifolia x 'Inchmery Kate'	1	1	2	2 from same cutting
		1	2	ditto
		1	1	
		1	0	cutting decayed

The table shows that in all but one case at least one new bulblet was obtained. In two cases the cutting produced 2 bulblets.

It is hoped that others interested in Nerines will report on their results with bulb cuttage.

LITERATURE CITED

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—— Review of the Genus Nerine, in Plant Life 23, 1967.

THE 1966-67 AMARYLLIS SEASON

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Another amaryllis season has passed with more outstanding flowers in evidence than in many years. In the south the mild winters have been kind to the amaryllis the past few seasons. Also the last two summers have been favorable to amaryllis growth and still more important is the fact that our interest in amaryllis returns. So we probably have given them more care during the growing season. If we will see that our amaryllis have a constant supply of food by watering them each ten days to two weeks with a weak solution of plant food we will be more than rewarded with a fine crop of blossoms in the spring. We must always remember that if our amaryllis are in pots that are set outside each rain may leach out the plant food. It is important to replenish this food after each rain. I find pressing business, pure laziness and other attractive nuisances often cause me to neglect fertilizing and spraying my amaryllis as often as I should. This year I have done a little

better and I am sure next spring I will be rewarded with much nicer blooms. The little additional care you give your amaryllis surely pays off in flowers.

In the past several years I have made a number of tables to set a large number of my potted plants on. This gives them better air circulation and is a lot less wear on the back taking care of them: I would like to suggest that you will find you will have more success with your amaryllis if you put some of the money you might otherwise use to buy bulbs into equipment to make it easier to take care of them. If it is easier to take care of them you will not be as apt to neglect them and the following season I feel sure you will have more beautiful flowers than you would have had if you had put all your money into buying bulbs. Having a lot of bulbs does not in itself assure you of flowers. While you can brag to your neighbors all summer about how many varieties you have if you do not take care of them you may be embarassed when you have only a few small flowers to show him in the spring. One well grown bulb is worth a dozen that do not flower. Of course there are those who do not try to carry bulbs over from year to year but just buy a few prime bulbs to flower each season. They figure they get their money's worth when the bulbs flower. They throw the bulb over the back fence after they have flowered. They do not bother with the fuss of taking care of them during the summer. But for those who like the challenge of growing amaryllis much satisfaction can be found in taking care of their plants all summer. I can not quarrel with either method. But I am the type who can go out in my amaryllis patch and admire the bulbs during the summer. Good foliage and a plump bulb even looks pretty to me when they are growing well.

SIZE OF BULB TO BUY

I am often asked which size bulb is best to buy. This is a hard question to answer but I will try as best I can. Generally speaking there are about three sizes commercially available. These are basicly 24/26 cm., 28/30 cm., and 32/up cm. size. I really think that one gets about the same value regardless of the size he buys. It is more the end use to which you will put the bulb. If I were buying to make a bed of them in the south I would purchase the 24/26 cm. size or smaller. I would have in mind getting the most amaryllis for my money and that I would give them the care they needed to make proper growth. The 24/26 cm. size usually will make one or two flower scapes and those with a modest income can get a wealth of enjoyment from two or three of these bulbs planted each year.

If the price of the bulbs is not a great factor to you then you might decide to purchase the 28/30 cm. size. This size, if the bulbs root well will give much larger flowers generally than the smaller size bulbs. The larger bulb, if it is well cared for, should recover for the next flowering season easier than a smaller bulb. You will find certain varieties in the 24/26 cm. size literally will flower themselves to death while others make a more modest spike it can support.

If one has the money to put into bulbs one might choose the larger size bulb. The largest bulbs usually make the largest flowers. If the bulb does not root well it still will make a better spike than the smaller bulb. Also the larger bulbs often make three spikes. If you want exhibition flowers get the largest bulb available. In this regard if you have ever seen an 'Apple Blossom' from a well rooted 32/up cm. bulb it is a gorgeous thing—much prettier than from a small bulb.

Generally speaking a person will be more satisfied if he puts his money in the largest bulbs he can buy. He will not have as many bulbs, but his chances of success are better and I feel he will be much more pleased with the results the first season. If you are a beginner I suggest the 28/30 cm. or the 32/up cm. size bulbs. But if you have mastered their culture you can surely have more varieties at less cost with the smaller size bulbs.

WHAT VARIETIES TO BUY

If you are a new fan do not just buy the variety you happened to see take the largest or best flower in the show. Normally I feel the new fancier is better off asking a reliable amaryllis dealer to send him several varieties he thinks would be easiest to flower. You might suggest the color but more than likely it would be best to leave the color to him. When the dealer receives your order he can pick good varieties that have made the best bulbs that year. The bulb dealer is interested in you having success and he never knows until he receives his bulbs which varieties will be in best condition. He will more than likely pick varieties which had held their roots when he received them. If you receive bulbs with roots your chances of success are much better provided you do not use too heavy a soil or over water them and rot the roots. If you prefer picking your amaryllis I might suggest a few that generally give good results each year.

White: 'White Christmas', 'White Giant'.
Pink and White: 'Floriade', 'Little Diamond', 'Rose Marie'.
Pink: 'Dutch Belle', 'Daintiness', 'Fritz Kriesler'.
Medium Rose: 'Rubia', 'Bella Vista', 'Queen of Pinks', 'Queen of Sheba'.
Dark Rose: 'Moreno', 'Bordeaux'.
Blend: 'Day Dream', 'Cupido'.
Salmon: 'Mozart', 'Beautiful Lady', 'Rilona'.
Orange Red: 'Orangedale', 'Tangerine', 'King Gustav Adolf IV'.
Medium Red: 'Scarlet Leader', 'Flamboyant', 'Rembrandt'.
Dark Red: 'Tarakan', 'Vintage', 'Purple Queen', 'Red Master'.
Red & White: 'Hellas', 'Thalia'.

Of course if you do not see a favorite of yours on this list, I possibly just forgot it. I could not list all but only a few that come to mind at this time. Of course there are many fine new clones that will prove most worthwhile.

TRENDS IN AMARYLLIS HYBRIDIZING

Several noteworthy trends in hybridizing are showing up in the newer varieties on the market. One factor results from the demand for amaryllis as cut flowers in Europe. The growers have given emphasis to getting two scapes of flowers at a time, better lasting quality of flower, less fragile flowers and up to six flowers per spike. The lasting quality of flower has possibly reached its highest degree in Van Meeuwen's 'Hellas'. It makes six flowers per spike and will last for weeks if the weather is cool. Van Meeuwen is placing more emphasis on six flowers per spike than any other grower and many of his new varieties make six flowers. He does not like the 6 flowers to open at once but two at a time so the first 2 may be picked off when the last two open thus giving a long season of flowers per spike. Most of these clones that give 6 flowers per spike last longer in flower than the older ones. The Van Meeuwen firm has made great strides in their hybridizing recently and they were awarded three gold medals in shows last season. This was more than any other Dutch Amaryllis Grower received.

The Van Meeuwen firm is striving to introduce more free flowering kinds also. You will find their newer bulbs are generally more free flowering, have more flowers per spike and last longer. For many years Van Meeuwen leaned heavily to the red varieties and still seems to favor this color but has in the last several years introduced some outstanding varieties in other colors, blends and bi-colors. They have several extremely late flower clones that were introduced last year. These reds are 'Donnar' and 'Etna'. They are fully two weeks later than most other clones and appear to have near kin-ship with *A. Aulica platypetala*.

Warmenhoven in the past several years has introduced some fine clones that have been a departure from the solid colors which were so popular when Dutch Amaryllis first became well known in this country. These are 'Floriade', 'Golden Triumphator', 'Florileen', 'Little Diamond' and 'Mt. Everest'. Warmenhoven's clones generally are very large flowering but do not all make four flowers per spike. His new clones generally are very vigorous and probably more adaptable to outdoor culture in the south than other Dutch clones. I am quite sure he has kept closer to the old Leopardii line which instills vigor.

I am told that Warmenhoven is interested in the cut flower trade and is developing clones that are more useful in this respect. One orange clone I received last year in some quantity made two spikes at once with four open on each spike. This group of clones were probably sent to me by accident for another clone but although the flowers were not as large as most of Warmenhoven's clones they were excellent pot flowers for the florist trade.

Ludwig and Co. are best known for their pink varieties. They are still the only firm that offers such clones generally to the public. They have made great strides in improving these and have a number of light pink and medium rose pink clones on the market. 'Dutch Belle' is possibly the best formed pink they have and flowers rather freely. 'Flora Queen' generally flowers rather poorly for me the first year; however I

find it the easiest to maintain and generally after the first year I can get wonderful flowers from it. It often makes six flowers per spike. 'Trixie' is a fine medium dark rose from Ludwig and Co.

Generally the Dutch hybridizers have increased the color range considerably in the past several years and particularly in the bi-tones and blends. They have constantly increased the number of flowers per spike, increased the free flowering habits and are striving to perfect amaryllis that will become popular for the florist trade.

NAMED CLONES

The most popular and most widely grown clone today and possibly the first amaryllis to be established as a commercial variety is 'Apple Blossom'. Most growers cultivate it as it is in great demand and fills the requirement as a commercial clone. It does not decline in vigor as many others do. Possibly the next most cultivated clone is 'Ludwig's Dazzler'. This clone can make extra large bulbs which makes it a most desirable commercial clone. 'White Giant' is also a fine commercial clone. The shrimp and white colored clones, 'Margaret Rose', 'Sweet Seventeen' and 'Day Dream', which are very similar, are very popular and are fine commercial types. The White flushed pink clones have become very popular also in the past few years and are generally easy to flower. The most sought after type however are the picotees which are always scarce.

I have lost my interest for trying every new clone that is introduced each year. I seem to become more interested in them after I have seen them for several seasons; so if I do not mention your favorite new clone do not be disappointed.

WHITE CLONES

'White Christmas', 'White Giant', 'Flying Cloud' and 'Oasis' are fine free flowering clones and each season restore my faith in them. There are a number of other good whites which I will not mention. We all have our favorites. One I would like to mention is C. Warmenhoven's white. These generally are not named. They have an ivory white color when first open as with 'Oasis'. I feel they are a little different and worthy of note especially as I consider they have more Leopoldii genes in them and this should make them more suitable for outside planting in the south. Do not feel I am selling other old clones like 'Maria Goretti' short. It and other clones such as 'White Giant' do well planted out in the south.

NEAR WHITE

The whites penciled or flecked slightly with red are striking. Two clones, 'Marion' and 'Peppermint', are most noteworthy in this particular color. I am sure there will be others. The picotee type, white edged red is still extremely popular, flowers easily the first season, but some have trouble maintaining it after the first year. It does bloom from small sizes so try a smaller pot and do not try to make too large a bulb. There

will be newer clones in Picotee types that will be improved. Picotee is surely one of my favorites and a most beautiful type.

BI-TONES AND STRIPED CLONES

Ludwig's 'United Nations' and 'Carousel' are still very popular and make nice large flowers. For sheer beauty 'Florilien' is exceptional. It is an immaculate white veined heavily with bright red. It is outstanding. 'Hellas' is a fine new red and white bi-tone which makes six flowers per spike and keeps for weeks. 'Orion' is a fine new white striped red that grows vigorously and should prove to be a fine show flower as it gets large.

PINK & WHITE

A very popular group with many good clones to choose from. Possibly the largest is 'Floriade'. 'Apple Blossom', however, will make a huge flower from large bulbs as the size of the flower in this clone varies remarkably with the bulb size. If you can obtain the true 'Little Diamond' it is one of the most beautiful amaryllis I know. It will make two spikes at once with four flowers each of perfectly round flat form. 'Pygmalion', 'Rose Marie', 'Rosy Dawn' and 'Love's Desire' are all fine white and pink clones. Possibly I should mention 'Thalia' here. This new one from Van Meeuwen, more rose or red and white than pink and white, is a most beautiful and free flowering clone especially when given a little shade.

BLENDED COLORS

'Day Dream', 'Margaret Rose' and 'Sweet Seventeen' in shrimp pink and white are the most popular still. 'Catherine Valenti' is a very large frost rose and white that is exceptional. 'Golden Triumphator' and 'Cupido' are extra fine golden orange and white clones.

PINK CLONES

Ludwig and Company is the only firm that offers any number of these clones. 'Dutch Belle', 'Heaven Sent' and 'Flora Queen' are all beautiful.

ROSE CLONES

In soft rose the new African clone, 'Coral Seas' is exceptionally beautiful. 'La Forest Morton' in medium rose is still a leader. 'Trixie' is fine in the darker shades along with 'Rubra' and 'Rosedale'. 'Elvira Armayo' and 'Muscotel' are similar color having a lavender tone. Both these have their admirers. In dark rose 'Moreno' and 'Bordeaux' along with 'Mystery' fill the bill.

BRIGHT RED AND LIGHT RED

Often when one talks about bright red or light red the two get confused. I assume bright red has more fluorescence and light red leans toward pink but often the lighter reds are the brighter. This is a color

tone that is being neglected but I feel some progress is being made. Like 'Barbarossa' which was a nice bright red these clones tend to degenerate to orange red. 'Red Rover' is a nice light vermilion variety. 'Donnar' is a light bright scarlet of note. The new clone, 'Etna', is still lighter and brighter. These two should be a welcome addition. Both are extremely late varieties and have slightly different texture and color from the other reds.

SCARLET

'Scarlet Leader' is possibly the best all round scarlet I know. 'Scarlet Triumph', 'Red Champion' and 'Clone 65' are all good scarlets.

MEDIUM RED

I think the 'Flamboyant' and 'President Kennedy' are possibly the leaders in this particular color. Both are fine reds of different form. I personally like the open face of 'President Kennedy'. The petals do not tend to roll back in this one as with other clones. 'Rembrandt' is a fine medium red that should not be overlooked.

DARK RED

The list of good dark reds is growing very fast. Van Meeuwen has introduced several good ones in this color recently. 'Belinda', 'Bernice', 'Mars', 'Pandion' and 'Tarakan' are a few. All are too new to be properly evaluated but so far 'Tarakan' has impressed me most. It is free flowering and is an exceptionally fine clone. In the African amaryllis several new dark reds are available. They are also too new to comment on but should not be forgotten. 'Purple Queen' and 'Red Master' are fine wine reds. My 'Purple Queen' plants last season made huge blooms, possibly the largest flowers I had. 'Ludwig's It' is a fine dark red. 'Vintage', another African amaryllis, has won many friends these past several years. And we must not forget Ludwig's 'Franklin Roosevelt'.

SALMON & ORANGE CLONES

In this color it is hard to find clones that do not degenerate to orange red. Ludwig's 'Beautiful Lady' is one of the leading salmons. 'Mozart' is a fine new salmon. 'Rilona' is the lightest salmon available and 'Hecuba' is a fine deep salmon. Many still favor 'Queen Page'. In true orange there are few. 'Orange Orchid' has flowered more red the past few years. It was wonderful for several seasons but tends to bloom red. 'Orange Wonder' still remains orange and possibly this is why it is called orange wonder. Few stay in this color. 'Delilah' is a fine tangerine orange and 'Orangedale' is a similar color.

ORANGE RED

I feel the leading one in this color is possibly the African clone, 'El Toro'. However it gets redder each year. 'Cavalier' and 'Cherokee' are fine orange reds. The new clone, 'Nitora', might be classed as an orange red. It, however, is possibly more a medium red with a fiery orange overtone. This makes it especially beautiful.

AFRICAN AMARYLLIS

I would like to mention particularly the Hadeco Strain of African amaryllis as these are generally grown from offsets rather than cutting and apparently do well here in the south. There are a number of fine clones introduced by this firm particularly in the white and rose bitones, dark reds, orange reds, and rose colors. These clones are shipped from South Africa in late August or early September and are available in early October. The first year they flower in the fall in about 5 to 6 weeks after they are planted. Many people have the mistaken idea that these amaryllis will flower in the fall each year but this is wrong. They are no different from the Dutch hybrids in this respect and will revert to spring flowering in the northern hemisphere.

AMARYLLIS SPECIES

My interest in these rises and falls very sharply from time to time. I have spent several thousand dollars having them gathered in South America. Then I took orders and had great expectations only to be disappointed myself and to have to disappoint my customers. I have discontinued trying to sell them.

I would like to comment on several of the species, however, particularly from the standpoint of developing new hybrids.

Amaryllis leopoldii This species has been lost to cultivation which in itself is a mystery. I believe the Warmenhoven strain is more nearly developed around this species or genes than any other hybrids. I have one hybrid clone from Guatemala that when selfed produces seedlings with pure white, white striped, picotee types and 'Beacon' type flowers along with many other seedlings that nearly resemble *Amaryllis leopoldii*. Time has not permitted me to investigate selfing these offsprings but I feel this hybrid has a great deal of *A. leopoldii* in it. The offspring generally do well in this location and this gene line, I feel, is possibly best for outside planting in the south.

Amaryllis aulica. Generally the form of *A. aulica* I have does well here, but they have to be given winter protection when temperatures fall below 30° F. They grow well in peat with a little lime and cow manure added. They require some shade for best results. It is generally the most robust and vigorous species I have.

Amaryllis aulica stenopetala This is exceptionally robust and vigorous. It, however, needs to be kept dry during June and July to get a good number of flowers. It can be expected to bloom from September to November.

Amaryllis aulica platypetala This species grows well here and is possibly more adapted to this region than *A. aulica stenopetala* as it flowers in July and August and tends to go dormant in the winter. It makes sufficient growth in summer to maintain itself in a flowering condition. I consider this one of the very best species for hybridizing to improve amaryllis hybrids for the south.

Amaryllis psittacina This species seems to just about hold its own here neither dying out or flowering very often. Possibly with a little special care it could be pot-cultivated here. As I have found *A. aulica* requires more shade than I suspected this is possibly the case with *A. psittacina* also.

Amaryllis elegans This species fails to respond here as I feel the climate is too wet and hot for it. A more airy, cooler climate possibly would be better.

Amaryllis striata This species will grow like a weed during the summer here only to rot during the winter. It appears to like a sandy soil but I do not think it likes it cooler than about 60° F. The bulbs are very fleshy making rapid growth and appear to be hard to store.

Amaryllis reginae I have only had fair success with this species here. It will grow like a weed for a while only to rot later. It, too, like *A. striata* appears not to be able to take cool temperatures. I fear I have also given it too much sun and it apparently requires more shade.

Amaryllis belladonna This species will naturalize in the Jacksonville area where it is well drained and where roots of trees and shrubbery take up enough water during the winter to protect it from getting too wet and cool.

Other species only do fairly here without special attention which I seldom have the time to give. Possibly in a year or so when I retire I may find that time. I do hope so for I feel there are possibilities in hybridizing for many colors and types of amaryllis not available on the market today. With more understanding of the requirements of these new hybrids I feel we can find much better pot plants for our northern fanciers that can be maintained year round year after year.

I would like to pass on to you a few tips which I hope will improve your flowers next season. First I feel the greatest cause for failure is insect damage to roots and under fertilization of plants. *One can help his amaryllis greatly if he will drench his potted amaryllis with a solution of Cygon and water each 6 to 8 weeks.* Be sure you have an open textured soil and that the plant has a plentiful supply of fertilizer at all times. Watering your plants regularly with a weak solution of liquid fertilizer will help. Remember if your potted amaryllis is set out doors during the summer months each heavy rain will wash most of the fertilizer out of the pot; so fertilize after each heavy rain.

AMARYLLIS STRIATA FOR RAPID INCREASE

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While my primary plant interest during the past 20 years has been in the amaryllid genus *Narcissus*, I have also grown a few bulbs of the genus *Amaryllis*. I have been limited in that activity by my inadequate growing facilities for that rather tender bulb. (I should not have left my native home in southern California.)

About six summers ago a member of a local garden club gave me three small plants of a thing she said was an amaryllis. The largest of the three bulbs was not over an inch in diameter. I planted each in a pot and kept them outside until danger of frost when I took them in and kept them in a window until spring when they went out again for the summer. By autumn the plants had grown until they nearly filled the six inch pots with vigorously-growing offsets.

Fig. 25. **Amaryllis striata** Lamarck as grown by Willis H. Wheeler. Arlington, Virginia. Photo by W. H. Wheeler.

Growth continued inside during the autumn and winter. In February scapes pushed up quite tall. Each carried four florets. As one of my Japanese plant pathologist friends observed, they were not spectacular, being orange-red with a narrow white stripe along the middle of each narrow perianth segment. Since I have been an amateur plant breeder for many years I selfed the blooms and copious seed production resulted. Crossing with Dutch and South African hybrids also resulted in plentiful seed.

I have been interested in the vegetative increase of bulbs of the genus *Amaryllis* since the time some years ago when I discussed the matter with two raisers of that flower. They were hopeful that it might finally be possible to have good clones of amaryllis that would reproduce rapidly by bulb division. With that in mind I wondered if my amaryllis acquisition, tentatively identified by Dr. Traub as *A. striata*, might pass on to its offspring the ability to reproduce by the more rapid production of offsets.

WHEELER—**AMARYLLIS STRIATA**, continued on page 125.

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PLANT EXPLORATION IN MEXICO, 1966, 1967

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In 1966 and again in 1967 the writer has continued making plant exploration expeditions into Mexico, for the purpose of introducing new bulbous material to science and the horticultural world. Mexico is especially rich in bulbous plants owing to its diverse geography and seasonal rainfall, which makes for a variety of climactic conditions. Bulbous plants of some kind are to be found nearly everywhere, whether in the deserts, the mountains, or the lower tropical regions. The *Amaryllidaceae* are represented by *Allium, Habranthus, Sprekelia, Crinum, Hymenocallis, Amaryllis L., Bessera, Milla, Dandya, Petronymphe,* and *Zephyranthes.* No doubt there are others as well, but we also find Irids growing from true tunicated bulbs of the *Tigridia* group and its allies, such as *Nemastylis, Rigidella, Cipura,* and *Eleutherine,* not to mention the many tuberous rooted *Sisyrinchiums* and the fibrous rooted *Orthosanthus. Oxalis* growing from truly scaly bulbs, as in the genus *Lilium,* are found in some form almost everywhere. The *Liliaceae* are represented in the many species of *Calochortus, Zygadenus, Anthericum,* and *Schoenocaulen,* to name but a few. The bulbous members of the *Agavaceae* are best seen in the many *Manfredas, Bravoa, Polianthes,* and *Runyonia.* Other families, such as Begonias, Gesneriads, Aroids, Gingers, Bromeliads, Marantaceae, Musaceae, Commelinaceae, and Orchidaceae, have their terrestrial bulbous representatives. Even some cacti are tuberous rooted as are the Dahlias.

I. 1966 EXPLORATION—JULY 10 THROUGH 26, 1966

In 1966 the writer was accompanied by James N. Giridlian of Oakhurst Gardens fame, and the trip covered much of Central and Southern Mexico, as well as Guatemala. Over 160 collections were made, but if one includes bromeliads and orchids, it is certain that the number of species was well in excess of two hundred.

Our trip enveloped 5000 miles and included the many adventures that such a trip normally accrues. James had traveled in Mexico before, so he was pretty well prepared for what was to follow, though he does not speak Spanish. His wide knowledge and keen interest in plant life of all kinds made the trip especially interesting for both of us and we found it mutually educational as well. Although the trip went quite smoothly, it was not without its pleasant and unpleasant aspects. There were the usual border delays, and while Mr. Giridlian remained hale and hearty, the writer, (who had never been seriously ill on the many trips over the past fifteen years) finally contacted the dreaded amebic dysentery just as we were returning home. This little souvenir literally "bugged" me for several months after returning home, but it has not discouraged me from continuing my field trips.

Although we had been very careful about locking our car, we slipped up the one time that we forgot to do so, and had two of our bags lifted

from our car in broad daylight in Mexico City while stopping for lunch on our way homeward. Unfortunately one of the bags contained James' camera equipment, as well as our tourist cards and car permit. As if the loss of some of our valuables was not enough, the loss of these necessary papers caused a delay of one day at Nuevo Laredo before they would allow us to re-enter our country, and we were fined sixteen dollars each as well for not having our papers with us. Our explanation that we had been robbed failed to create any sympathy. It is times like these when you can appreciate the good old USA, no matter how much it is criticized, either justly or unjustly.

James took it all in stride and never complained, although I must confess that I showed my impatience with the Mexican authorities while being detained so unnecessarily. I believe that they were finally as glad to be rid of me as I was to be rid of them!

While I won't go into the details of every collection made, I will try to point out some of the highlights. The first day of our trip found us driving from the City of San Luis Potosi, San Luis Potosi, to the city of Queretaro, in the state of Queretaro. Many stops were made, but since most of this area is on the dryer side in the central plateau country, few really new species were to be found. It mattered little to James though, as it was his first trip to go a-bulbing in Mexico (his previous trips had been in search of epiphytes in the southern tip of Mexico) and he was eager to collect any new plants that he found appealing. This included *Zephyranthes longifolia*, *Habranthus concolor*, and an unidentified white *Habranthus* species. The latter was collected along with many other interesting plants on a short side trip into the mountains East of the City of San Luis Potosi. Here too grew *Milla biflora*, *Zephyranthes Clintiae*, *Sprekelia formosissima*, a large *Tigridia* which we presumed to be *T. pavonia*, cliff hugging *Tillandsia* species, and a little insect eating plant, *Pinguicula caudata*, a member of the butterwort clan, with lovely purple flowers looking much like a small pansy, but with a "spur"-like affair similar to that of larkspurs. We decided to collect these on our way back home, but as things later developed, we were not able to do so. Fortunately for James, I was able to return to this area six months later and collect some of these odd carnivorous plants for him, since insect eating plants seem to be a very important part of his nursery business.

North of the city of San Luis Potosi we had also collected a plant of the *Manfreda* clan with tunicated bulbs having a large basal plate and succulent purple spotted or striped leaves. It appeared very much like our Texas *Runyonia tubiflora* which grows along our lower Rio Grande, and it could perhaps be that species or a related one. We also collected *Oxalis* in several forms and a pretty pinkish little *Allium* with membranous coated bulbs which sent forth stolons.

The end of the first day found us properly tired, but cleaning our day's "haul" in a nice motel just outside the City of Queretaro, where we were able to dine in a nice restaurant and reflect over the many things we had seen that day. The second day, Monday July 11th, found

us on the road again, now on highway 55, with Toluca as our destination. The day was a busy one with many unusual plants being collected. All types of bulbous material were found, many of which we did not have the haziest idea as to their identity. James was very much impressed with a lovely colony of coral-red *Bravoa geminiflora* growing in grassy, rolling hillsides in the state of Mexico. Also growing with them was a beautiful golden yellow *Calochortus* species with the fragrance of honey. He was delighted with the beauty of the lovely yellow bells which enclosed those delicate hairs seen in many members of that genus. Mexican *Calochortus*, unlike their North American counterparts, grow and flower in the summer, during the rainy season, making them relatively easy to grow anywhere in cultivation. James also was enchanted with the many species of *Tradescantia* and *Commelina*, and collected the many kinds that grow with tuberous roots. Even the tuberous-rooted geraniums were fair game.

Toluca, as usual, was damp and cold, and our motel room was heated for us. The next morning found us still heading southward toward Taxco and the state of Guerrero. So rich was this country in interesting plant life that James was like "Alice in Wonderland". Tillandsias, Orchids, tuberous Begonias, *Oxalis* of all types as well as an endless variety of other bulbs kept us busy. A fine colony of *Oxalis deppeii* captured our attention. Not only were there the usual coppery-red forms, but also forms in deep rose and lavender as well. We began collecting those with more prettily marked foliage as well. Near the Guererro-Mexico state lines we found a large colony of small yellow flowered Tigridias in full flower. James photographed them while I dug some of the bulbs growing in very heavy clay soil that remained wet after rains. After getting all the pictures that he wanted, he helped me dig Tigridias, along with a terrestrial orchid of the *Spiranthes* group, and some other unidentified tuberous rooted things. A little later we dug a little *Milla* species just inside the Mexico State line. These were in full bloom on a limestone hillside. This proved to be the same as a collection that I had found in both 1964 and 65 in the state of Morelos, near Cuernavaca. I was pleased to find that it also grew here, near the Mexico-Guerrero state line. This little species, the smallest in the genus, has threadlike leaves, only 1 mm. broad, oddly fuzzy stems, and typical white flowers with green stripes on the reverse of each segment, as in *M. biflora*. We dug corms of this plant and added them to our growing collection. A few more miles southward and we were collecting another species of *Calochortus* which was not yet in flower, and *Tigridia meleagris*, that strange Irid that looks so much like a purple and gold *Fritillaria* when in flower. *Sprekelia formosissima*, various *Oxalis*, and a *Bomarea* were also found, along with various tuberous rooted Begonias and other odds and ends.

A few miles north of Taxco, James was to become acquainted with *Bessera elegans* and *Milla magnifica*. He was completely taken by the giant *Milla magnifica* and needed no invitation to add these to his growing collection of bulbs. A most unusual tuberous *Begonia* with a single flat

ground-hugging leaf almost stole the show, however. The leaf was often as large as a dinner plate, from the center which arose one or more tall stems bearing light pink Begonia flowers of typical form. Neither of us had ever seen such a *Begonia*. Though tempted, we did not tarry in Taxco, but decided to drive to Iguala to spend the night, in the interest of saving time. Iguala, at a much lower elevation, was uncomfortably warm and we were only too glad to be on the road the next morning. Below Iguala, I again stopped to collect that weird little member of the *Milla* group which I had previously thought to be the long lost *Diphalangium graminifolia*. These were not yet in bloom, but I dug some specimens anyway. Since then, I have flowered this in cultivation and it now appears to be a new species in the genus *Dandya*. The little flowers nod gracefully in the loose umbel, as in *Bessera*, but the flowers are white, with reflexing segments. The effect is similar to a *Dodecatheon*, or "Shooting Stars" of the primrose family. Indeed the name, "Shooting Star Lily" has been coined for this plant, and the name seems appropriate.

In this same region we again collected the rare little dwarf *Sprekelia* species that I have previously collected in the area around the Oaxaca-puebla state lines in previous trips. These were not in flower, but the tiny bulb and leaf, no larger than a small *Habranthus*, were instantly recognizable to me. I have been able to flower this tiny jewel only once, in a pot, and the small spidery flowers are of typical *Sprekelia* form, although the segments are no wider than that of any *Hymenocallis!* This plant is currently under study by Dr. Traub at La Jolla, and may perhaps be described as a new species if it can be flowered.

We saw many colonies of several species of *Hymenocallis* in Guerrero, but did not collect any, as I had adequate stock from collections made in previous years. These included *H. Choretis* (*H. glauca*), *H. riparia* growing in and along streams, and a species yet to be described.

That night was spent in Acapulco, temporarily giving us a taste of "civilization" and the faces of American tourists again. But it did not last long, for we returned northward towards Iguala once more, collecting plants with a vengeance. We made several stops in the vicinity of Chilpancingo, finding many bulbs and plants of interest. We found a lovely colony of *Bessera elegans* which included the full range of its colors. The scarlet and coral-red shades predominated but there were a few purple or violet shades, and quite a few "tricolor" forms that were red on the outside and red-and-white with blue tips within! Later I collected that stunning yellow flowered Irid that is presumably a *Nemastylis* of some sort. Near the little village of Acahuitzotla, which the newer, present road has bypassed, we stopped to search for *Petronymphe decora*, a rare gem allied to *Milla* and *Bessera*. We never could find the "rock nymph" but we did find a host of other interesting plants including a purple *Achimenes* and another Gesneriad that we could not identify, along with several terrestrial orchids, *Bommrea*. A pretty *Oxalis* with velvety leaves, Begonias, and a beautiful purple and gold form of *Tillandsia capitata* clinging to the cliffs.

Another uncomfortable night in Iguala once again and then westward on a gravel road leading to Teloloapam, about 35 miles westward. For several years I had been seeking a little-known region in the state of Guerrero known as District Mina, where two very rare *Milla* species have been reported. . . . *M. delicata* (pink) and *M. mortoniana* (blue), neither of which is in cultivation. District Mina is said to be west of Teloloapam, near the Guerrero-Michoacan state lines, but is not easily accessible by automobile, as there are no paved roads, and the existing gravel and earth roads are rough. The road to Teloloapam quickly bounced us up into the mountains and we found many interesting plants. *Milla magnifica* was fairly abundant and we found one specimen with leaves over five feet long, almost as tall as James. A *Tigridia* with yellow buds showing grew there too, and it appeared to be a yellow form of *T. pavonia*. It was accompanied by *Sprekelia formosissima*, and an *Anthericum* of some sort, along with a *Manfreda*. Farther down the road we found *Hymenocallis riparia* growing in a stream and in full bloom. We collected another tuberous *Begonia*, and some *Tillandsias*. We finally bounced into Teloloapam and found it to be a most enchanting little town, completely unspoiled, with cobblestone streets, and an air of long-ago about it.

I would like to have lingered and investigated, but our trip there had bounced our brains loose and we both agreed not to continue any further westward towards District Mina on THIS trip, since it looked like it would require more time than we had bargained for. We turned about and bounced back toward Iguala once more, and where there was PAVEMENT. We stopped at Iguala long enough to enjoy a milk shake and hamburgers at an American-type drive-in. Quite a jazzy contrast from Teloloapam! From there we drove to Cuernavaca and then eastward to the Pan American highway. By evening we were at Huajuapan, in the state of Oaxaca, where we spent the night. The next morning found us collecting a pretty, small brown-flowered *Tigridia* that is not described as yet, and a very attractive dwarf white flowered *Anthericum*. Later that morning we collected a small blue flowered *Commelina* and a very attractive small *Tradescantia* with bright purple flowers. Another stop yielded a lovely golden yellow flowered *Sisyrinchium*, a pretty little xerophytic *Tillandsia* related to *T. plumosa*, and an attractive *Echiveria* species.

Nearing the City of Oaxaca, we found another exciting group of plants. One particularly, a *Milla* species, proved to be another undescribed gem which I had overlooked in previous years. Like so many botanists before me, I had incorrectly assumed it to be *M. biflora* without looking it over more closely. Another of the night flowering kinds, this new species would be yet another in the growing list of undescribed species in the *Milla* group. My sudden enthusiasm infected James as well, and he helped me in digging specimens. We collected other odds and ends, including Tillandsias, and bulbous Irids before entering the City of Oaxaca for rest and relaxation.

The next morning we took a side trip from the City on the road to Puerto Angel and back, collecting many interesting plants in the mountains. Once again we left pavement behind us and bounced our way onward over the rutted washboard surface. James hung onto the grab-bar on the dashboard for dear life and vibrated like a milkshake.

Our collections were very good and we found many things to interest each of us. I found a new species of Irid with purplish brown flowers which turned out to be another addition to the new genus *Fosteria*. We also dug *Sprekelia formosissima*, *Calochortus*, and a small Amaryllid that we could not identify, as it was not in flower, but which may be a *Habranthus* or *Zephyranthes*. James was elated when I discovered a strange little plant with white flowers and narrow leaves with bulbous bases. It was a species of *Pinguicula* with which he was unfamiliar, and a plant which he assured me had made the entire trip worthwhile, if he could get them home alive. Continuing further, we came across a colony of *Zygadenus* of some sort, with branched panicles of small greenish white flowers. This was my first encounter with this member of the Lily family in Mexico. Nearby we found quite a number of *Bomareas*, a climbing plant, in full flower and we took both tubers and seeds, hoping that maybe we could get some to live, as they are very difficult to dig what with the tubers being so brittle. I am still batting zero where *Bomarea* is concerned. The seed failed to germinate and the tubers did not survive. We began to find few bulbous plants of interest and only Tillandsias to keep us occupied, so we decided to return to the City of Oaxaca as it was beginning to get late.

The next day we drove southward to the town of Tehuantepec, collecting a few Bromeliads, but little else. Tehuantepec, like Iguala, is at a low elevation, and therefore tropical and uncomfortable. We were glad to get away from there and continue down the coastal highway to Tapachula and entry into Guatemala, stopping only to collect a few *Tillandsia concolor*, and bulbs of *Eustylis purpurea* and a pretty rose flowered *Oxalis*. We also observed that our little night flowering *Milla* from Oaxaca, and the stoloniferous *Milla* of Chiapas and Guatemala overlapped in the area near the Oaxaca-Chiapas state lines. We ate supper at Tapachula and headed for the Guatemalan border.

Entry into Guatemala went smoothly for a change, no doubt due to the fact that I agreed to accept a young naval academy student who was the son of a Guatemala City official as a passenger to Guatemala City. James was a bit leery of taking a stranger along, but his fears proved unwarranted. Our new friend proved to be engaging company, and a helpful hand when we experienced a flat tire the next morning. When we arrived in Guatemala City, our friend took us to his home, where we were introduced to his mother and sister. They proved to be a most gracious trio of hosts and hostesses. After being fed we were then taken on a tour of the market downtown where we were able to buy some of the beautiful textiles that Guatemala is world-famed for. The entire episode left us with a warm glow as we drove northward toward Mexico again. This time we would return through "El Tapon", the dreaded

land-slide area that follows a river in a gorge between high mountains. But first we visited the lovely old Spanish city of Antigua, once ruined by a terrible earthquake, but now reconstructed and a "must" for tourists. The night was spent at Panajachel on the shores of famed Lake Atitlan. We observed several clumps of a very beautiful White flowered *Crinum* with large bowl-shaped flowers and chartreuse markings in the throat. Neither of us had ever seen this one before and I decided that I must have it. The Motel manager very graciously refused to accept any money for it and had an Indian, colorfully garbed in typical costume for that area, dig a few bulbs for us with a machete. Though we have not positively identified it, it seems that our new "find" is allied to *C. giganteum*, and might possibly be *C. virgineum*, a species rarely seen in cultivation, and not to be confused with the hybrid known as "Virginicum", which bears no resemblance to it.

Although Guatemala is a most beautiful country in every way, the parts that I have seen are no haven for bulbs, simply because of the excessive rainfall. The area around Huehuetenango is a bright spot though, as a very lovely *Milla* with nocturnal flowering habits and offsetting freely by underground stolons is to be found growing in grassy rolling pastures. This *Milla*, known as 64-95, will soon be described in a forthcoming monograph, which will include many new species.

Another Irid, *Orthosanthos*, with fibrous roots, and fan-like foliage topped by showy blue flowers, beckoned, and we took both seeds and plants. These failed to survive fumigation, and I am convinced that some of these things should be dipped rather than fumigated to prevent heavy losses. Our greatest surprise of the day came when we found a pretty pinkish flowered *Allium* in flower on a grassy slope. This was to be the first *Allium* reported from Central America, and has since been given the name of *Allium guatamalense* Traub. It is a fairly tall *Allium* with scapes over a foot high and numerous pinkish flowers with darker midribs in each segment.

The trip through El Tapon was uneventful, and it was obvious that the road was in far better condition than in 1964. I understand that it is now finally in the process of being paved, and should now be an easy trip for any motorist. The deep gorge abounds with Tillandsias and other epiphytic plants, and we stopped to collect *Tillandsia seleriana* and a few orchids. It was raining when we reached the Mexican border and we were rushed on through and before we knew it we were in Mexico again, heading towards Comitan for a night's rest. The next morning we drove a few miles South of the City to collect various odds and ends before driving northward again. A dazzling scarlet *Tigridia pavonia* with hugh 7" flowers was sighted on the outskirts of a small village. I had never seen such large flowers in this *Tigridia* before, but James shattered my enthusiasm by stating that such large flowers in *Tigridia* were not unusual in cultivation in California! I was crushed.

Nearing the city of San Cristobal de las Casas, we stopped several times to collect several kinds of Tillandsias and epiphytic orchids, such as *Odontoglossum pulchellum*, as well as a *Tigridia* species with brown

flowers. North of the City we collected several kinds of Terrestrial orchids, a large *Vriesea, V. wreckleana,* growing on rocky outcroppings above the roadsides in the mountains, and the usual odds and ends of miscellaneous material. We did not spend any time in Tuxtla Gutierrez stopping only long enough to eat, and then continued northward to Tehuantepec once more and another uncomfortable night in the humid tropics.

Time was beginning to run out on us as we headed homeward from Southern Mexico, and we were covering a greater number of miles each day and spending less time collecting, other than the obvious things that could be spotted from the car while driving. We continued taking our toll in epiphytic plants, namely Tillandsias and orchids of various kinds as we drove from Tehuantepec to Oaxaca and then northward to Huajuapan de Leon, where we took the recently paved Mexico 125 to Tehuacan, Puebla. A few miles South of Tehuacan, in fabulous cactus country, I re-collected 62-44, a nocturnal flowering, stoloniferous *Milla* species that I had first found in 1962. These were not yet in flower and I was able to transplant them safely in my garden where they continued growing and flowered late that same summer. A species of *Schoenocaulen,* and a strange liliaceous plant with white bell-shaped flowers and tuberous roots were dug in the same general area.

The next morning, a few miles out of Tehuacan, I became aware that I had been hit by dysentery. At first I supposed that it was only the usual thing that seems to hit every neophyte-tourist . . . jokingly called "Turistas", "The Mexican Quick-step", or "Montezuma's Revenge". I was not at all worried, since these things generally last only a couple of days or less. We had lunch in Mexico City, at a nice sidewalk cafe in a busy suburban area where we could sit and watch our car, which we thought to be locked. A group of men and women casually strolled past and paused, while talking, by our car, and then casually continued down the street. We did not realize it at the time, but we had witnessed our bags being lifted from the front seat of our car! They did not get anything other than the two bags which they could easily reach without being noticed, but one of these bags contained James' photographic equipment, including film and special lenses. Luckily they did not get his camera. But unluckily the bag also contained our tourist cards and car permit! This was to result in a day's delay and a ridiculous fine at the border. My bag contained various pills, etc. in the event that one of us became sick. Now that I needed these drugs, they were gone! We finally arrived in San Antonio, still bitter about the events in Mexico City and at the border, but with a car load of plants, and already talking about plans for future trips. Such is the way with explorer-botanists and plantsmen interested in botanicals out-of-the-ordinary.

II. 1967 EXPLORATION—JULY 23 THROUGH AUGUST 7, 1967

The writer has made a series of botanical trips into Mexico, still looking for new and rare bulbous material. I was accompanied on my "big" annual trip in 1967 by Les Hannibal, long known in round-robin circles

and in the APLS as a breeder of Crinums and Brunsvegias, and an interested student of Amaryllids in general.

Mr. Hannibal arrived by jet, and we were off and away a couple of hours later towards the West coast of Mexico. Our first day was spent collecting plants in the state of Durango. I had made this phase of the trip twice before, earlier, in the summers of 1964 and 1965, so late-flowering things I might have missed before. I was on the look-out there was really very little new that I expected to find, other than a few for *Allium* species though, as the area seemed to be rich in them. Our first species was found East of the City of Durango and was the same plant I had collected in 1964 and 65, with underground stolons. These were all in the bud stage, but I knew the flowers to be pinkish. A few miles closer to Durango City, I spotted what looked like another *Allium* in full bloom, growing in wet roadside ditches. This was a new species to me and we dug bulbs and placed several flowering plants in the plant press that I had taken along with me for such an event. These Alliums grew in clumps, increasing only by division and had large umbels with white flowers with a faint pinkish midrib to each segment. The soil in which they grew was heavy greyish clay. This *Allium* was given the number 67-14 for identification purposes.

Milla biflora was in full bloom everywhere, and many fine specimens were collected for study. At kilometer 1054, I spotted a most unusual member of the *Manfreda* group and their allies, with brownish bell-shaped flower on tall wiry stems. Neither of us had the foggiest idea what it might be. Individually the flowers reminded us of the bells of some Fritillarias.

South of Mazatlan the following day, we found ourselves in lush rolling country where *Bessera elegans* is at its best, in all its colors which include the usual scarlets as well as carmines, rose-shades, and purples. Mosquitoes here were terrible and I was forced to wear a plastic raincoat and a towel over my head to keep from being bitten. This in spite of the fact that I had sprayed myself heavily with a repellent! Nearing Tepic, we found ourselves out of the mosquito area and we could make our collections in a more comfortable fashion. By evening we were in the eastern portion of the State of Nayarit, and I spotted *Hymenocallis horsmannii* in a cultivated *Agave* field among volcanic rocks. With it grew *Sprekelia formosissima* in the powdery black volcanic soil and we dug these, since some of them had foliage very heavily pigmented with red in the lower portions.

The following day we continued collecting plants into the state of Jalisco, stopping in Guadalajara for lunch before driving southward toward the coast. Poor Les had already suffered a short bout with the "Turistas" and I proclaimed him to be formally initiated. Little did either of us know that he was not to get off so lightly nor did we suspect that he would take a "souvenir" gastro-intestinal infection home with him.

Our morning collections had been very successful, what with finding another *Allium* species, 67-35, growing in a roadside ditch about

a mile west of Magdalena, Jalisco, along with a very fragrant pinkish white relative of our garden tuberose. We did not know if it was a *Polianthes* or perhaps a *Bravoa*, since *Bravoa* is sometimes given as a synonym for *Polianthes*. At any rate it seemed quite garden-worthy and since I could not identify the plant I took no chances that it might not be a new species. I have long since learned not to assume that a new plant can be identified every time. Many of them are still undescribed. which is why we continue collecting and making field trips.

Below Autlan, Jalisco, on Mexico 80, we stopped to collect *Bravoa geminiflora*, and found a stunning brown-and-gold *Calochortus* species in full bloom. The pendant bells were produced in amazing abundance from each plant, with many buds and flowers showing. It is noteworthy that many of the bulbous plants of Mexico have flower-forms or habits to protect their pollen from the frequent summer afternoon showers. Many flowers are nodding and bell shaped, as seen in some of the *Calochortus*, *Bessera*, *Petronymphe*, and some Tigridias that remain open in the afternoons. Others are nodding and tubular, such as seen in *Polianthes*, *Bravoa*, and *Manfreda*. Even the terrestrial orchids tend to surround their lips with their segments in order to protect their pollen. *Zephyranthes* solve the problem by closing when suddenly shaded by a cloud. *Hymenocallis* try to avoid the problem all together by waiting until the afternoon showers pass before opening in the late evening. Many *Milla* species simply remained closed during the day, reopening each night. *Hymenocallis*, *Sprekelias*, *Habranthus*, and *Zephyranthes* get their flowering done with the first rains of the season before the really heavier rains follow later. Some of the Irids flower early in the morning or late in the evenings when they are less likely to be rained on. Over and over again, these bulbous plants each develop habits or flower forms to insure that they will be able to protect their pollens, and therefore their futures.

We found *Hymenocallis azteciana* Traub, flowering below Autlan and dug a few of these along with a very large species of *Bravoa* with broad shiny green leaves and red flowers. By this time it was afternoon and raining, and we did little more collecting. The rains finally stopped and we had almost reached a little village known as La Huerta when it happened. A strange clatter in the engine told me that I had serious motor trouble and I stopped the car and waited for someone to come along to tow us. Someone did. We spent the next four days in La Huerta while our engine was removed, taken to Guadalajara, completely disassembled, parts machined and replaced, and then thoroughly cleaned. It was returned to La Huerta where our mechanic, a genius in my book, put all the little parts back together again and then returned the motor to the car. We still have a sneaking suspicion that he took it completely apart just to see what made the little Volkswagen engine "tick". But no matter, his services were only forty dollars American, not including the parts and machine work done in Guadalajara. In essence I had a new motor.

Meantime we had much time to kill, and nothing to do. The o
cafe fit to eat in was filled with buzzing flies from morning until s
down. The menu left much to be desired for in the way of varie
though the food wasn't bad, if you are accustomed to Mexican food
I am. Les was not, and the pounds were dropping off him daily.
big man and hearty eater, he was eating so little that I had to goad h
into eating lest he become weakened from fasting. The many mil
and strange foods were beginning to wear on him. He was terrifica
bored from the many days of doing nothing. I did not blame hi
Nothing is worse than being stranded in such an uncomfortable pla
and in such an uncomfortably hot climate, when one's days and funds a
limited, and when one's plans are being altered. The last two days w
managed to hire a man to take us into the mountains north and south
the village in his pickup truck to collect plants. It helped soften th
grim situation and gave us something to do.

At last our car was ready, (about midnight), running like a Swis
watch, and we prepared to leave the next morning. It was with el
tion that we bade La Huerta farewell, and drove first to Manzanillo an
then the city of Colima, Colima, where we ate lunch. The morning'
collection had been very good, as we had found a *Hymenocallis* with
glaucous leaves, which may or may not be anything new, and a colony
of stunning fuchsia-purple *Bessera*. These were the finest that I hav
seen in this shade, and I was not certain if this was simply a variety of
B. elegans or perhaps a new species, but I finally decided that it really
was only a variety, since there were no physical characters that were
unique enough to easily distinguish it from *B. elegans*, when seen as
a dried specimen. I stopped again to collect a little *Milla* species
that I had found in 1965. I have yet to see it in flower though I hav
collected it in different months. It is a new species, I feel sure, but it
must flower very late. Other collections were made along the way,
but nothing that was new from the 1965 trip.

We spent the night in Zamora, Michoacan, and the next morning
the auto was giving us trouble again. I got a mechanic to check it and
found that we needed new points and a new ignition coil. By noon we
were on the road again, heading down Mexico 37 towards Uruapan and
then the coast. Les was in better spirits and we made several collections
before reaching a small cross-roads cafe and gas station know as Cuatro
Caminos, and the road to the Michoacan coast, only half of which is yet
paved. At kilometer 165, about 10 miles south of Cuatro Caminos, in
gritty red volcanic soil on a dry hillside facing east, I found it. A lav-
ender-blue flowered member of the *Milla* family, and obviously a
species of *Dandya*. Indeed it resembled the line drawing of *D. purpusii*
shown in Dr. Hal Moore's monograph on "The Genus *Milla* and its
Allies", and which had been made from a dried specimen. It also great-
ly resembled the new little white *Dandya* species from Guererro, with
the "shooting star" appearance, except that the flowers did not nod in
the umbel, nor did the segments reflex. Corms were dug, though they
were not plentiful, and specimens were placed in the plant press to dry.

Shortly after that our pavement ended, but we proceeded onward to the little town of Arteaga, about 45 miles from the coast. The little town was a delight, unspoiled by tourists, and charming in every way. Our hotel room was comfortable, and there were flowers everywhere. Things would have been great had Les not had another attack of the "turistas" during the night. This time he could not get rid of it. We drove back towards Cuatro Caminos the next morning, and stopped a few times to collect various Amaryllids along the way. One was a glaucous leaved *Hymenocallis* in leaf only, and a real find was *Sprekelia clintiae* with the glaucous blue-green leaves. Though known in cultivation, this plant was not known from the wilds, at least not officially. A somewhat similar *Sprekelia* had been collected near Morelia, Michoacan by Mr. and Mrs. Clint, Walter Flory and Ray Flagg, but these had coarse glaucescent foliage, and were most likely variants of *S. formosissima*, whereas this plant had pretty glaucous foliage and a rather dainty overall bearing.

Many miles of unpaved road later, found us back in civilization at Patzcuaro, Michoacan where we had supper, before driving on to Morelia for the night.

The next day we drove to Toluca, picking up more *Bravoa geminiflora* and a little stoloniferous *Allium* along the way, among other things. We were heading homeward again, and we spent the following night in Guanajuato. Les was still plagued with his gastro-intestinal problem, but he was learning to live with it and was eating more heartily. The next day we drove out of the states of Guanajuato and Jalisco, and into the state of San Luis Potosi, collecting a variety of bulbous plants enroute. These included a new *Milla* species, 67-64, *Habranthus*, two kinds of *Calochortus*, a most variable *Milla biflora* colony and an *Allium*. The next day we drove from the City of San Luis Potosi to Cd. Victoria, and collected yet more material and also stopping long enough to get our plants cleaned and in order.

We entered the United States through Brownsville, taking time to visit with Mrs. Morris Clint, Mrs. Helen Winans, and Mrs. Sulema Etchison, all extremely fine gardeners in their own right, and all interested in Amaryllids and bulbs of all kinds. These visits were a highlight of our trip and gave us time to unwind from the hectic pace in which we were once again reminded to expect the unexpected.

Wheeler—**AMARYLLIS STRIATA**, continued from page 112.

My pollinating activities have produced a lot of seeds during the past several years. Lacking both the time and facilities to plant them I have sent them to my correspondents in Japan, the Netherlands, and the Republic of South Africa, for whatever use they might be to those persons for the improvement of the genus. As yet I have heard of no blooms from the crosses but there should be reports in the not too distant future.

PLANT GROWTH, FLOWERING AND FRUITING IN GYPSOPHILA OLDHAMIANA L.,

FOLLOWING SEED TREATMENT WITH P^{32}

S. Bose and A. Hati

Dry seeds of *G. oldhamiana* (Sutton's) were treated for 24 hours with P^{32} solution the dosage being 0.2 uc per seed. Control seeds were kept in water for the same length of time.

Germination was noticed first in seeds treated with P^{32} and two days later in control. There was not much difference in the range of germination period of the control and treated seeds. The percentage of germination and the survival of plants till maturity was highest in control and lowest from P^{32} treatment. Mean of plant height in the plants originating from P^{32} treatment was much lower than in control. Mean number of branches were greater in the plants originating from P^{32} treatment and likewise there was increase in the number of leaves here. Flowering was noticed first in control and a week later in the plants originating from P^{32} treatment. Number of flowers per plant was also highest here. There was great variation in the size of pollen grains and pollen sterility was also highest in the plants originating from P^{32} treatment. The percentage of fruit set and the number of seeds per fruit was, however, lowest here (Table 1).

Table 1. Effect of P32 on **Gypsophila oldhamiana** L.

Observations; Treatment	Control	P32
No. of seeds per treatment	100	100
No. of seeds germinated	59	20
No. of plants surviving till maturity	55	13
Percent of control	100	25.6
Plant height (cm)	28	22.5
No. of branches per plant	9	12
No. of leaves per plant	43	55
No. of flowers per plant	32	36
Range of flowering period (days)	8	11
Percentage of pollen sterility	12.3	72.8
Percentage of fruit set	80	30
No. of seeds per fruit	9	2

Crosses attempted between treatment x control and the reciprocal showed no seed formation while control x control plants showed 50 per cent seed formation.

Sincere thanks are due to Prof. P. K. Sen, Khaira Professor and Head of the Department of Agriculture for his interest and for providing facilities during the course of this investigation, and to Dr. A. K. Sharma, Reader, Department of Botany, for kindly supplying P^{32}.

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NEW GUATEMALAN AND MEXICAN ALLIUMS

Hamilton P. Traub

In the first report (Traub, 1967), *Allium howardii*, from Edwards County, Texas, was named, and plants which Dr. T. M. Howard had collected in the State of Hidalgo, Mexico, were identified as *Allium glandulosum* Link & Otto. This report was based on bulbs collected by Dr. Howard up to 1966 in southern Texas, Mexico and Guatemala, and were turned over to the writer for identification. In 1967, Dr. Howard made two trips into Mexico, and again brought back *Allium* bulbs. Some of these are identified, or are named as new, in the present report.

SECTION **RHOPHETOPRASON**, GENUS **ALLIUM** L.

Prior to 1967, the process of vegetative reproduction in the two Mexican species, *Allium glandulosum* Link & Otto, and *A. longifolium* (H.B.K.) Spreng. was not understood. In observations made at La Jolla, it was determined that flowering-sized bulbs are produced terminally on usually long rhizomes, *the old bulbs not persisting*, as shown in Fig. 26. On the basis of this very distinctive feature, the Section *Rhophetoprason* was proposed (see Traub, 1967, p. 110).

There are also two other species (*Allium bolanderi* and *A. unifolium*) which increase by a somewhat similar process, but these species have different bulb coat characters, and they are therefore retained under Subsection *Bolanderiana*, Section *Lophioprason*, at least for the present.

IDENTIFICATION OF PREVIOUSLY NAMED SPECIES

In the past, four *Allium* species had been named from Mexico:

(a) *Allium kunthii* G. Don (1827), syn.-*Schoenoprasum* lineare H.B.K. (1816)

(b) *Allium longifolium* (H.B.K.) Spreng. (1825) syn.-*Schoenoprasum longifolium* H.B.K. (1816)

(c) *Allium scaposum* Benth. (1840)

(d) *Allium glandulosum* Link & Otto (1841)

As already indicated, *Allium glandulosum* has been collected by Dr. Howard in the State of Hidalgo and thus this species has been verified. In 1966, he also collected a form of it in the State of San Luis Potosi (Howard 66-3B). This plant is within the species range.

This still leaves three formerly described species to be verified. In order to assist collectors, photocopies of three of the (name-bearing) specimens are reproduced in this article. Through the kindness of the Director, Herbarium, Museum of Natural History, Phaner. Paris (P), photocopies were obtained of the name-bearing specimens of *Allium kunthii* G. Don, and *A. longifolium* (H.B.K.) Spreng., and these are reproduced in Fig. 27. A photocopy of the nomenifer specimen of *Allium scaposum* Benth., was received through the kindness of Dr. George Taylor, Director, Royal Botanic Gardens, Kew, Herbarium (K), and this

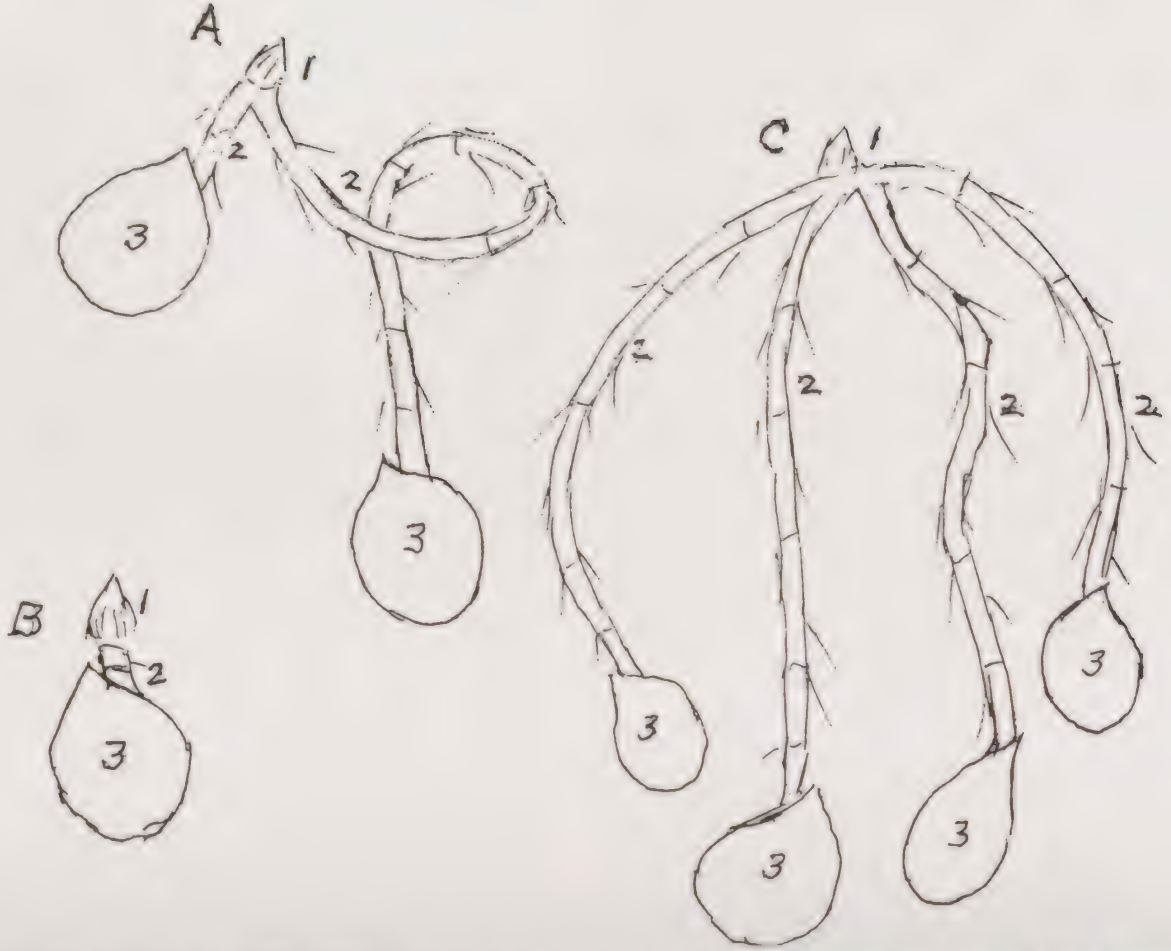

Fig. 26. Line drawings (approx. natural size) showing the type of asexual reproduction in **Allium longifolium** (H.B.K.) Spreng. **A**, self-fertile plant. **B**, male-sterile plant; and **C**, **Allium glandulosum** Link & Otto, self-fertile plant; pot grown plants.

A-1, B-1 and C-1, dead vestiges or remnants of the old bulbs. A-2, B-2 and C-2, rhizomes between the vestiges and the terminal bulbs, A-3, B-3 and C-3, which are flowering sized. Grown at La Jolla, Calif. 1966.

is reproduced in Fig. 28. In addition, we are indebted to Dr. William T. Stearn, Department of Botany, British Museum, Herbarium (BM), for a photocopy of an isonomenifer of *A. scaposum*, which is shown in Fig. 29. With these as a background, it is hoped that the three previously described species can be verified by comparison with living plants collected, or to be collected in Mexico by Dr. Howard.

Fig. 27. Composite (note scales) from negatives furnished by courtesy of the Director, Herbarium, Mus. Nat. Hist. Phaner. Paris (P), Humboldt & Bonpland Herbanium. **Left, Allium kunthii** G. Don (syn.-**Schoenoprasum linearе** H.B.K.), the **holonomenifer specimen**, from contact print, note darkened background; **Middle**, the same, slightly enlarged, with background somewhat cleared up; plant approx. 18 cm. high. **Right, Allium longifolium** (H.B.K.) Spreng. (syn.-**Schoenoprasum longifolium** H.B.K.), the **lectonomenifer specimen.** Note **immature rhizome** protruding from bulb base; and **very long** leaves hard to manage on the herbarium sheet.

VERIFICATION OF **ALLIUM LONGIFOLIUM** (H.B.K.) SPRENG.

With the help of collections made by Dr. Howard, a second species, *Allium longifolium* (H.B.K) Spreng., has been verified during 1967.

An inspection of the lectonomenifer specimen of *Allium longifolium* (see Fig. 27) shows first of all that there is an *immature rhizome* protruding from the base of the bulb, and the leaves are very long and hard to manage on the herbarium sheet. Earlier American workers were thrown off the track by confusing this *immature rhizome* with a *root,*

not realizing that the roots of North American Alliums are not that thick; they are usually quite thin. In *Nothoscordum bivalve* (L.) Britton also they are always thin. Thus, the *immature rhizome* and the very long leaves were dismissed and the few-flowered umbel with pedicels of unequal length (see Fig. 27) were emphasized and confused with the umbel in *Nothoscordum bivalve*. This in spite of the fact that the pedicels of that species when in flower are not markedly unequal in length, but often elongate considerably *after anthesis* resulting in contrasting unequal pedicel length in fruit. But this feature is not always constant for sometimes the pedicels after elongation are subsimilar in length. Having thus gone astray, former American workers rejected the lectonomenifer specimen as shown in Fig. 27, and unrealistically hoped to locate a different specimen. Under the conditions, this was a hopeless wish, and it led to a stalemate from which we are only now extricating ourselves by recognizing the facts in the case.

Dr. Howard has collected specimens of *Allium longifolium* in two locations—Jalisco (H 67-35) and in Michoacan (H 57-11B and H 64-57A). The former is a plant which matches the holonomenifer in size, and the latter is a little larger plant, but apparently belongs to the same species. On the basis of these, an emended description has been made of *Allium longifolium* and is published in the present report. Thus, we can rest assured that this species has at long last been verified. This leaves only two previously described Mexican species to be verified—*A. kunthii* and *A. scaposum*.

ALLIUM KUNTHII AND A. SCAPOSUM

Up to the present, these two species have not been verified by means of living plants, but Dr. Howard is planning to collect in the nomenifer localities indicated by Humboldt & Bonpland for *A. kunthii* in the early 19th century in central Mexico; and in the indicated habitat of *A. scaposum* in the State of Aguascalientes. These explorations should yield plant material for clearing up this problem. In the past, *A. scaposum* (Figs. 28 and 29) has been considered as a synonym of *A. kunthii*, Fig. 27 (Ownbey, 1950; Traub, 1967) in spite of the fact that *A. scaposum* is a much larger plant, and quite different from *A. kunthii*.

REVISION OF SUBSECTION MEXICANA, SECTION AMERALLIUM, AND SECTION RHOPHETOPRASON

Up to very recently, only four *Allium* species had been described from Mexico, and none from Central America, and these four were usually grouped under only two recognized species names. With the present report, the number of recognized species has been markedly increased, and includes even one from Guatemala. This requires an explanation. [*Allium glandulosum* has been collected in Honduras.]

The *Allium* species of Mexico are in the most part summer and autumn flowering plants, and unless they are collected during these seasons, many of them may be missed. This explains why in the past, the Mexican Alliums have been neglected. Collectors usually made a single

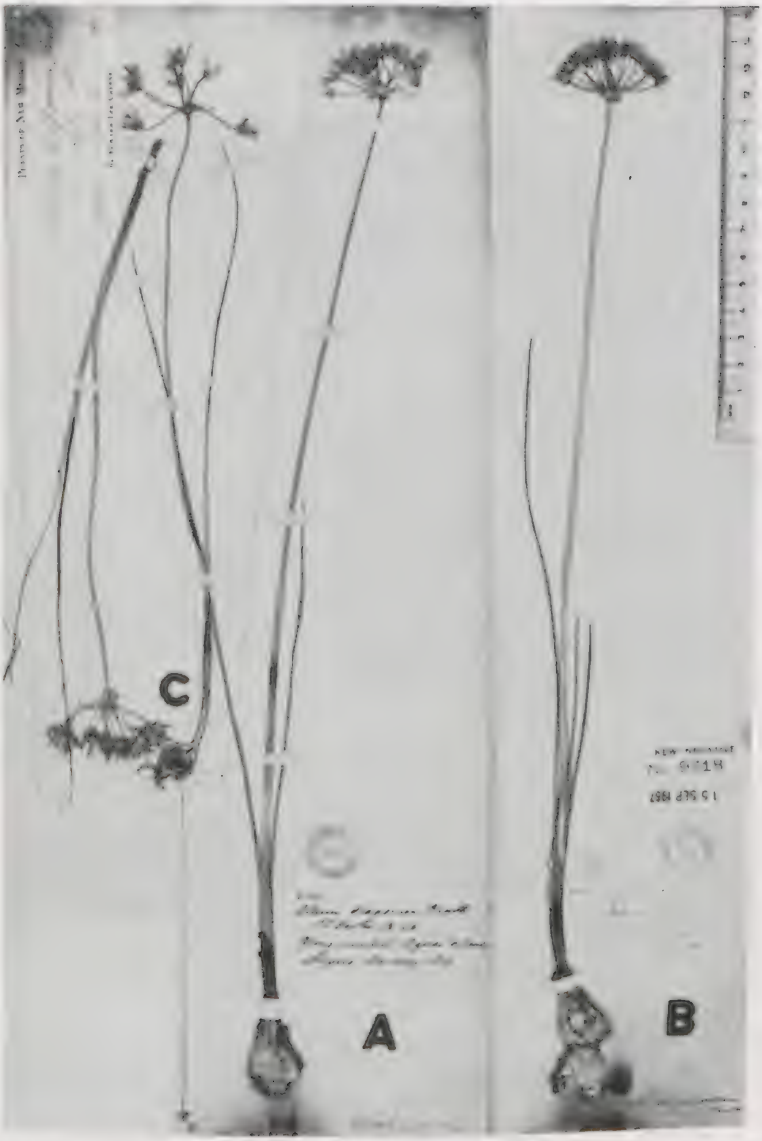

Fig. 28. Composite (note scale) from photo-print furnished by courtesy of Sir George Taylor, Director, Royal Botanic Gardens, Kew, Herbarium (K). (A) **Allium scaposum** Benth. in Herbarium Benthamiana, Hartweg no. 234, Aguascalientes, Mex., annotated in Bentham's handwriting, the **holonomenifer specimen;** plant approx. 64 cm. high. (B) **A. scaposum** Benth., in Herbarium Hookeriana, Hartweg, Zacatecas, Mex., tops of leaves missing. (C) **Allium** sp., not **A. scaposum** Benth.; Edward Lee Greene, Pinos Altos Mts., Grant County, New Mex., Sept. 14, 1880, a small plant with leaves subequaling or surpassing the scape; leaf at left spirally twisted (see under magnification); short, immature non-scaly rhizome at base of bulb; apparently **A. durangoense** Traub.

Fig. 29. Composite (note scales) from photoprints furnished by Courtesy of Dr. Wm. T. Stearn, Department of Botany, British Museum (BM); **Left, Allium scaposum** Benth. Isonomenifer specimens. Right, Ruiz, collected.

trip in the spring or early summer and thus the Alliums were rarely found. Dr. T. M. Howard, who has collected bulbous plants in Mexico and Guatemala since 1957, has usually made more than one collecting trip in each year, and thus has found many undescribed plants in such a group as the Tribe *Milleae*, and incidentally also Alliums.

Although a goodly number of Mexican *Allium* species are now recognized in the present report, it is to be expected that still more will be found. Such regions as San Luis Potosi, with many mountain valleys, appears to be particularly rich in *Allium* species. Various other regions have not been explored for Alliums.

The present report is a continuation of the previous one (Traub, 1967, pp. 88-95; 110), and includes the species recognized since 1967. In the case of species previously described, references to the last best descriptions are given.

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Traub, Hamilton P. Subsection *Mexicanae* of Section *Amerallium*. Plant Life 23: 88—96; 110. 1967.

KEY TO THE SPECIES OF SUBSECTION **MEXICANA**, SECTION **AMERALLIUM**; AND SECTION **RHOPHETOPRASON**

1a. Plants multiplying by means of seeds, bulb division, or bulblets on short, or longer rhizomes, the old bulbs persisting:

SUBSECTION **MEXICANA**, SECTION **AMERALLIUM**

2a. Plants multiplying by means of seeds only:
3a. Plants tall, robust, up to 90 cm. tall:
4a. Flowers broadly campanulate, tepals 9 mm. long, whitish with deep lavender mid-vein; pedicels thick, 2 mm. in diam., somewhat discoidally enlarged at the apex; leaves 4.5 mm. in diam. (Guatemala) ..... 1. **guatemalense**
4b. Flowers campanulate, tepals 6.5 mm. long, whitish with red mid-vein; leaves linear terete (Mexico: Aguascalientes) .. 2. **scaposum**
3b. Plants intermediate (to 18 cm. long) to small:
5a. Umbel more than 5-flowered; plants glabrous, leaves narrowly-linear:
6a. Spathe 7—9 mm. long; leaves narrowly-linear, straight; flowers whitish, red mid-vein (Central Mexico) ..... 3. **kunthii**
6b. Spathe 1.2—1.6 cm. long; leaves 2, spirally twisted; 2 mm. wide; pedicels **unequal** in length, 1.5—2.2 cm. long; flowers campanulate, tepals pink, deeper mid-vein (Durango) 4. **huntiae**
5b. Umbel 2—5-flowered:
7a. Umbel 5-flowered; leaves 2—3, spathe 1.7 cm. long; pedicels 1—1.4 cm. long (Mexico State of Puebla) ..... 5. **pueblanum**
7b. Umbel 2—3-flowered; leaves 2, spathe 7—8 mm. long; pedicels 6—10 mm. long (State of Mexico: Telapon) .... 6. **telaponense**
2b. Plants multiplying vegetatively by bulb division, or by means of bulbs produced terminally on rhizomes, the old bulbs persisting:
8a. Plants multiplying vegetatively by bulb splitting:
9a. Roots **coarse**, to 3 mm. thick; umbel 8—12-flowered; flowers

campanulate, tepals lavender, with deep purple or blackish mid-veins; bulbs long-oblong (Mexico: Tamaulipas) .... 7. **mexicanum**

9b. Roots fine:

10a. Leaves smooth, light green, not ridged on back:

11a. Flowers white, tepals spreading, leaves 4—6 (Texas: Edwards County) ..... 8. **howardii**

11b. Flowers white to pale pink, keeled green or purplish; leaves 2—3 (Mexico: Durango) ..... 9. **mannii**

10b. Leaves 3—, or more, ridged on the back:

12a. Plants not denticulate; 3-ridged on back (Mexico: Nuevo Leon, Chihuahua State line) ..... 10. **traubii**

13a. Umbel few-flowered, in autumn; leaves narrow, 2 mm. wide ..... 10a. **traubii** forma **traubii**

13b. Umbel many-flowered, in summer and autumn, leaves 3 mm. wide ..... 10b. **traubii** forma **liberiflorens**

12b. Plant denticulate; leaves 5—6, 18 cm. long, 4.5 mm. wide, broadly canaliculate, 6—8-ridged on the back, denticulate on the ridges and leaf margins; scape flattish, denticulate on its ridges (Mexico Nuevo Leon) ..... 11. **ownbeyi**

8b. Plants multiplying vegetatively by means of terminal bulblets on very short or longer rhizomes, the old bulbs persisting:

14a. Rhizomes scaly, 2—3 cm. long; leaves 2—3 mm. wide, very finely serrulate (New Mexico: Gila Hot Springs) 12. **rhizomatum**

14b. Rhizomes not scaly:

15a. Bulblets borne on very short rhizomes; umbel 10—30-flowered in autumn; tepals pale with purplish or pinkish mid-vein; leaves 1—2 mm. wide (South Texas) ..... 13. **elmendorfii**

15b. Bulblets borne on longer rhizomes:

16a. Leaves not subterete:

17a. Leaves not spirally twisted:

18a. Leaves canaliculate:

19a. Bulbs very small, 6 mm. long, 4 mm. in diam; leaves 2—3, very narrow (Mexico: Michoacan) 14. **michoacanense**

19b. Bulbs larger, 1.5 cm. long, 1 cm. in diam.; leaves 4—5, green, 3—4 mm. wide (Mexico: San Luis Potosi, Valle de los Fantasmos) ..... 15. **fantasmosense**

18b. Leaves flat (San Luis Potosi) .... 16. sp. (H 67-87B)

17b. Leaves spirally twisted, 3—5, upright, 2—2.5 mm. wide, canaliculate; umbel 9—23-flowered; flowers broadly campanulate to almost stellate, tepals whitish, keeled reddish-brown, ovary pinkish (Mexico: Durango) 17. **durangoense**

16b. Leaves subterete, very long, light green, very slightly channeled on top (Mexico: San Luis Potosi) 18. **subteretefolium**

1b. Plants multiplying by means of seeds and bulbs produced terminally on long rhizomes, the old bulbs not persisting:

SECTION **RHOPHETOPRASON**

20a. Flowers brownish-red (mahogany), tepals spreading; leaves several sheathing below, upright, shallowly canaliculate, prominently striated on both sides; scape flattened, striated; umbel many-flowered (Mexico: Hidalgo, San Luis Potosi and Honduras) ..... 19. **glandulosum**

20b. Flowers campanulate, whitish to light lavender, tepals with deeper mid-vein; leaves smooth, thick, very long with tendency to lodging; umbel usually few-flowered in nature, but sometimes many-flowered under optimum culture; pedicels often unequal in length (Mexico: Michoacan & Jalisco) ..... 20. **longifolium**

SUBSECTION **MEXICANA**, SECTION **AMERALLIUM**

Subsection **Mexicana** Traub, **subsect. nov.**, Sect. **Amerallium**, genus **Allium** L.; in Plant Life 23: 90—95. 1967.
Tunicae bulborum membranaceae, fibris sparsis verticalibus; bulbis rhizomas terminantibus in reproducto diffissis; vel reproducto vegetativo nullo. Typus: **Allium mexicanum** Traub.

1. Allium guatemalense Traub, sp. nov., Plant Life 23: 90. 1967, anglise.

Planta robusta, bulba globosa, tunicis membranaceis, per semines reproducta; foliis 6—7 longis rectis infra vaginatis; scapo subcomplanato, supra subterete; umbella multiflora; floribus pro ratione magnis late campanulatis; pedicellis crassis ad apicem paulo discoideo-turgidis; ovario 6-cristato; capsula perobscure cristata; seminibus globoso-angulatis 2.5 mm. diametro.

HOLONOMENIFER: Traub No. 1071(TRA), grown at La Jolla, Calif. July 27, 1967, from bulbs collected by Dr. T. M. Howard, No. 66-124, July 11, 1966, south of Huehuetenango, Guatemala.

Plant robust, to 30 cm. tall, or taller, in nature (to more than 90 tall with optimum culture at La Jolla, Calif.) *Bulb* globose, 2 cm. long, 1.9 cm. in diam in nature (and 3.2 cm. long, 3 cm. in diam. under optimum culture at La Jolla, Calif.), deeply seated in the soil (to 3.5 cm.), outer bulb coats membranous, very dark brown (almost black), inner bulb coats white, with widely separated vertical fibers; after the first set of leaves around the scape decline and fall away, a new sprout with 2—3 leaves, sheathing below, appears next to the scape from the base where the new bulb forms. *Leaves* 6—7, gray-green, upright, the older declining as new ones are formed, at flowering time most of the leaves have declined, and a new central sprout appears and persists into autumn (see under bulb above); the first set of leaves are rather thick, channeled above, rounded on under side (10—15—21—30—36—40—50 cm. long, 4—5 mm. in diam., sheathing below to form a thick deciduous neck, purplish in lower half, 6—9 cm. above the ground, 8—9 mm. in diam. *Scape* central, flattish on one side, rounded on the other in lower half, subterete above, to 30 cm. or more tall in nature (to more than 90 cm. tall with optimum culture at La Jolla, Calif.), 5.75—6 mm. in diam. at the base, 3 mm. in diam. at the apex. *Spathe* monophyllous, closed at first, greenish-whitish with 9—10 dingy brownish-greenish vertical veins, changing to purplish, 2.6 cm. long, lanceolate, acute, soon bursting irregularly from the pressure of the expanding pedicels and flower buds. *Umbel* centripetal, 52—58- or more-flowered, (with sometimes a subumbel, 4—6-flowered, produced outside at the pedicel apex and setepal base of a flower, with smaller flowers having relatively shorter pedicels); normal flowers relatively large, broadly campanulate, light lavender in bud, opening whitish, with lavender mid-vein in each tepal. Flowers with an alliaceous scent. *Pedicels* green, stout, 3—3.5 cm. long, 2 mm. in diam., somewhat discoidally swollen at the apex. *Perigone:* tepals oblong, setepals 9 mm. long, 5 mm. wide, acute; petepals 9 mm. long, 4 mm. wide acute. *Stamens:* filaments purplish in upper ¾, 4.5 mm. long, filiform above, dilated below, united into a staminal cup at the base, with nectariferous tissue at the base between the 3 setepals and the base of the stamens; anthers purplish, oblong, 2.25 mm. long, shrinking to 1 mm. long at anthesis. *Ovary* 2 mm. high, 3 mm. in diam., ovules 2 per cell; 6-crested, 3 nectary pores appear on sides of ovary; style purplish, at first very short, elongating to 3.5 mm. after anthesis, then whitish; stigma undivided, minute. *Capsule* trigonous, 5 mm. high, 8 mm. in diam.; very obscurely 6-crested; seeds globose-angled, 2.5 mm. in diam.

RANGE.—South of Huehuetenango, Guatemala; low hillsides in grass between trees, growing singly, widely scattered.

NOTES.—A very distinct species, which apparently increases by seeds only. It resembles *A. glandulosum* and *A. longifolium* in the leaves sheathing below to form a relatively long deciduous neck, but otherwise is quite distinct—apexes of pedicels discoidally swollen, flowers broadly campanulate with an alliaceous scent, and other differences.

One male-sterile seedling (lacking viable pollen) has been observed. The plant is vigorous, but the pedicels of the umbel are rather shorter than in the self-fertile seedlings.

2. **Allium scaposum** Benth. in Pl. Hartweg. 26. 1840; Plant Life 24: 40. 1968.

HOLONOMENIFER: Hartweg no. 234, from Aguascalientes, Mexico, annotated in Bentham's handwriting, in Roy. Bot. Gard. Kew, Herbarium (K). Isonomenifer: Hartweg, in Dept. of Botany, British Museum, Herbarium (BM). See Figs. 28 and 29 for photo-copies.

Bulb ovoid. *Leaves* radical, linear-terete, long-sheathing below, shorter than the scape. *Scape* terete, slender, 30 cm. long or longer. *Spathe* bifid, broad, shorter than the pedicels. *Umbel* many-flowered; loose in fruit. *Pedicels* 2.5 cm. long. *Perigone:* tepals 6 cm. long, lanceolate, acuminate, rather acute, white when dry, red-keeled. *Stamens* subequaling the tepals, filaments subulate, dilated at the base.

RANGE.—Mexico: Aguascalientes, along small streams.

NOTES.—The nomenifer description is reproduced here to aid in matching-up the details with plants collected in the wild.

3. **Allium kunthii** G. Don, Mem. Wern. Soc. 6: 82. 1827; Plant Life 23: 59-60. 1967; Ownbey, Res. Stud. State Coll. Wash. 18: 221-222. 1950 (1951), in part; Traub, Plant Life 23: 94-95. 1967, in part.

Syn.- *Schoenoprasum lineare* H. B. K., Nov. Gen. et Sp. Pl. 1: 277. 1816.

HOLONOMENIFER: Humboldt & Bonpland [nr. 4286], Herbarium, Mus. Nat. Hist. Phaner., Paris (P). See Fig. 27 for photo-copy.

Bulb ovate, the size of a cherry, with numerous fibrous roots at the base. *Leaves* narrowly linear, flat, striate, glabrous, very thinly membranous at the base, sheathing to 10 cm.; shorter than the striate, terete scape. *Scape* erect, terete, striate, glabrous, 13—15 cm. long. *Spathe* ovate-lanceolate, withered, striate, glabrous, 7—9 mm. long, reflexed. Umbel 12—15-flowered; flowers whitish, tepals with a red mid-vein. *Pedicels* terete, glabrous, 1.4—1.8 cm. long. *Perigone:* tepals oblong, rather acute, spreading. *Stamens* as long as the tepals, filaments glabrous, subterete, anthers oblong, pollen gray. *Ovary* ovate, trigonous; style subequaling the stamens.

RANGE.—Mexico: between Santa Cruz de la Sierra and Mont El Gigante, alt. 2,346 m. Blooms in September.

NOTES.—The epithet *"lineare"* applied to this species by Kunth translates as "the long slender" or "linear". The name apparently refers to the long narrowly linear leaves. The species was formerly considered as similar to *Allium scaposum* Benth., and *A. longifolium* (H.B.K.)Spreng., which are quite different, larger species.

Up to the present it has not been matched up with living plants collected by Dr. Howard. However, he expects to search for it in the nomenifer locality in 1968.

4. **Allium huntiae Traub, sp. nov.**

HOLONOMENIFER: Howard 67-19B = Traub 1077 (TRA), July 22, 1967, west of Durango, Dur., Mexico; Mexican Highway 40, K. 1016.

Bulb ovoid, 1.5 cm. long, 1.2 cm. in diam.; outer coats dark brown, inner white, membranous, with sparse vertical fibers; not rhizomatous. Leaves 2, shorter leaf sometimes very short, 0.6—3.7—14.7 cm. long, about 2 mm. wide, apparently spirally twisted, channeled, acute, sheathing below to form a deciduous neck, 4.4—4.7—6 cm. long, 4 mm. in diam. *Scape* slender, 23—24—28 cm. long. *Spathe* 1.2—1.6 cm. long, membranous. *Umbel* lax, 11—13—18-flowered; flowers relatively small, campanulate, pink, keeled deeper pink. *Pedicels* slender, unequal in length, 1.5—1.8—2—

2.2 cm. long at anthesis. *Perigone*: tepals 7 mm. long 1.5 mm. wide. *Stamens* about 2 mm. shorter than the tepals; filaments 4 mm. long; anthers 1 mm. long at anthesis. *Ovary* globose, 1.75 mm. long, 1.5 mm. in diam.; appears to be slightly 6-crested; style 3 mm. long.

RANGE.—Collected by Dr. T. M. Howard (67-19B), west of Durango, Dur., Mexico; Mexican Highway 40, K. 1016; wooded hills, July 22, 1967.

NOTES.—*Allium huntiae* differs from *A. kunthii* in the spirally twisted leaves, the longer spathe, pedicels unequal in length, the pink campanulate flowers, and other particulars.

Named in honor of Miss Dora G. Hunt who ably assisted the late Dr. L. K. Mann with his researches in the genus *Allium*.

5. **Allium pueblanum Traub, sp. nov.**

Bulba ovoidea; foliis 2—3 anguste linearibus, infra vaginatis colla decidua formatis; scapo angustissimo; umbella 5-flora; floribus campanulatis albis; costis mediis tepalorum rubellis; pedicellis 1—1.4 cm. longis; tepalibus 6 mm. longis; staminibus quam tepalibus brevioribus; stylo in anthesin quam staminibus breviori; stigmate integro.

HOLOSOMENITER: Smith, Peterson & Narcisso Tejeda no. 3889 (=US 2897905), July 17, 1961, above Coxcatlan, between Apala and the top of Cerro Chichiltepec.

BULB 1.5—1.8 cm. long, 1.1—1.5 cm. in diam., ovoid, outer coats membranous, dark brown; roots fine. *Leaves* 2—3, narrowly linear, 17—19—24 cm. long, 1—2 mm. wide, sheathing below to form a deciduous neck, 3.5—5.5 cm. long, 3 mm. in diam. about half below the soil surface. *Scape* very slender, 9.5—11.5 cm. long, 1—1.5 mm. in diam. *Spathe* lanceolate, 1.7 cm. long, with sparse vertical veins. *Umbel* 5-flowered flowers campanulate, white, tepals with pink midveins. *Pedicels* very slender, 1—1.2—1.4 cm. long. *Perigone*: tepals 6 mm. long, 1 mm. wide. *Stamens* slightly shorter than the tepals 5 mm. long, anthers less than 1 mm. long at anthesis. *Ovary*, style shorter than the stamens at anthesis, stigma undivided.

RANGE.—State of Puebla, Mexico, above Coxcatlan between Apala and the top of Cerro Chichiltepec; igneous and sedementary rock outcrops with dark soils, primarily oak-pine forest; alt. ca. 2000—2500 m. Flowering in July and August.

NOTES.—From the evidence at hand, it appears that this species increases only by means of seeds. *Allium pueblanum* differs from *A. telaponense* mainly in having usually more than 2 leaves, a shorter scape a 5-flowered umbel, longer spathe and pedicels.

6. **Allium telaponense Traub, sp. nov.**

Bulba parva globosa; foliis 2 anguste linearibus, infra vaginatis colla decidua formatis; scapo angustissimo; spatha 7—8 mm. longa; umbella 2—3-flora; floribus campanulatis; tepalibus albidis, costis mediis subpurpureis; pedicellis 6—10 mm. longis; staminibus quam tepalibus dimidio brevioribus; stylo 4 mm. longo.

HOLOSOMENITER: John H. Beaman no. 2430 (=US 2360057), Sept. 4, 1958; State of Mexico, Telapon, north of Iztaccihuatl, south side of mountain.

Bulb small, globose, 1.2 cm. long, 1 cm. in diam., outer bulb coats brownish, membranous, roots fine. *Leaves* 2, narrow linear, shorter leaf 3—5.5 cm. long, longer leaf, 13—15 cm. long, 1 mm. wide, bluntly acute, sheathing below to form a deciduous neck, 6.5—7.5 cm. long, about half underground, above ground half purplish. *Scape* very slender, 18—22 cm. long. *Spathe* membranous, 7—8 mm. long. *Umbel* 2—3-flowered; flowers campanulate, tepals whitish, with purplish midveins. *Pedicels* very slender 6—10 mm. long. *Perigone*: tepals oblong, 7 mm. long, 2 mm. wide, apex bluntly acute or roundish. *Stamens* about half the length of the tepals; filaments 4 mm. long, filiform; anthers 1.5 mm. long before anthesis. *Ovary* globose, 2 mm. long, 2 mm. in diam.; style 4 mm. long, capitate.

RANGE.—State of Mexico; Telapon, north of Iztaccihuatl, south side of mountain, alt. 3450—3650 m., in grassy meadow, under open *Pinus hartwegii* forest; frequent. Flowering in late September—October.

NOTES.—From the evidence available, it appears that this species increases only by means of seeds. The two narrow-linear leaves, 2—3-flowered umbel, flowers small, pedicels very short, characterize this species.

7. **Allium mexicanum** Traub, **sp. nov., in Plant Life 23: 89, 90. 1967, anglise.**

Bulba elongato-oblonga, tunicis membranaceis, verticaliter fissa; radicibus subcrassiusculis usque ad 3 mm. diametro; foliis 3—4 breviusculis; scapo 21—23 cm. longo; umbella 8—12-flora; floribus campanulatis lilacinis, costis mediis atropurpureis; staminibus styloque quam tepalibus brevioribus.

HOLONOMENIFER: Stanford, Lauder & Taylor no. 2629 (=US 2219025). July 22, 1949, Tamaulipas, Mexico, between Marcella and Hermosa.

Bulb seated 3 cm. below soil surface, long-oblong, 3.5—3.8 cm. long, 1.1—1.5 cm. in diam.; bulb coats white, membranous, with sparse vertical veins, splitting vertically; roots *rather coarse*, to 3 mm. in diam. *Leaves* up to 4, upright, rather short, 10—14—15 cm. long, up to 3 mm. wide, bluntly acute to acute-rounded. *Scape* 21—23 cm. long. *Spathe* monophyllous, whitish, transparent, splitting to one side. *Umbel* 8—12-flowered; flowers campanulate, tepals lavender, with deep purple or blackish midveins. *Perigone:* tepals 8 mm. long, 2.5 mm. wide, oblong acute, withering, connivent in fruit. *Stamens* slightly shorter than the tepals; filaments 6 mm. long, anthers oblong, 2 mm. long, 2-lobed at the base. *Ovary* 2 mm. long, 2.5 mm. in diam.; style 3 mm. long, stigma undivided. *Capsule* 5 mm. high, 4 mm. in diam.; seeds 1 per locule, 4 mm. long, 2 mm. in diam., black.

RANGE.—Tamaulipas, Mexico, between Marcella and Hermosa, in burned over area.

NOTES.—*Allium mexicanum* is the only species in Subsection *Mexicana* with coarse roots. This feature, together with long-oblong bulbs, campanulate flowers having lavender tepals with deeper purplish midveins, and other characters, set it apart from the other species in the subsection that increase vegetatively by bulb-splitting vertically. Pedicels 1—2.2 cm. long.

8. **Allium howardii** Traub, **in Plant Life 23: 90—91. 1967.**

DESCRIPTION.—See Plant Life 23: 90—91. 1967.

RANGE.—Southeastern Edwards County, Texas.

NOTES.—This is a smaller plant than *A. mannii*, and differs from the latter in various particulars.

9. **Allium mannii** Traub & T. M. Howard.

Bulb oblong, 1.5 cm. long, 1 cm. in diam., coats membranous; increasing by vertical splitting of the bulbs; *leaves* 2—3, 20—35 cm. long, 3 mm. wide, canaliculate. *Scape* up to 55 cm. long; *spathe* 1.5 cm. long; *umbel* (15—) 25-flowered; *perigone:* tepals 10 mm. long, 1.5—2 mm. wide, white to pale pink, keeled green to purplish.

RANGE.—Collected by Dr. T. M. Howard (67—14), State of Durango, Mex. east of Durango City, on Mexican Highway 40; roadside, in low wet pastures and ditches, in heavy clay soil of volcanic origin, often growing in standing water after rains Alt. 1,829 m.

Named in honor of the late Dr. L. K. Mann, of the University of California, Davis, who made outstanding contributions toward the advancement of knowledge about the Alliums.

10. **Allium traubii** T. M. Howard, **in Plant Life 23: 62; 91. 1967.**

DESCRIPTION.—See Plant Life 23: 91. 1967.

RANGE.—State of Nuevo Leon, Mexico, near the Chihuahua State line.

NOTES.—This species differs from *Allium howardii* in the medium green, canaliculate leaves, 3-ridged on under side, 2 mm. wide, and in the few-flowered umbel, light lavender flowers, and other particulars.

Since the last report a free-flowering form with the umbel many-flowered, flowering in summer and autumn, is recognized here.

10a. **Allium traubii forma traubii. The nomenifer form.**

10b. **Allium traubii forma liberflorens T. M. Howard, f. nov.**

A typo in plerumque in culto sempervirens multiflorum et estive autumnaleque florens differt. Holonomenifer: #1078 (TRA), 9-19-67. Umbel many-flowered, appearing in summer and autumn. Leaves 3 mm. wide.

11. **Allium ownbeyi Traub, sp. nov.**

Specimen: T. M. Howard s. n. = 1066 (TRA), Nov. 1966, Nuevo Leon, Cerro del Obispado, 30 mi. n. Monterrey, Mexico.

Bulb 2 cm. long, 1.2 cm. in diam.; outer coats membranous, dark brown, with sparse vertical fibers; bulbs splitting vertically into 2 bulbs. *Leaves* 5—6, broadly canaliculate, glabrous above, bluntly acute, 6—8 ridged on the back, denticulate on the ridges and on the leaf margins, to 18 cm. long, 4.5 mm. wide; sometimes slightly spirally twisted. *Scape* flattish, or angled, denticulate on the margins, 24—28 cm. long, 2mm. in diam. *Spathe* 1—1.2 cm. long, monophyllous, prominently vertically 5-nerved. *Umbel* 7—13-flowered; flowers light lavender, tepals spreading, with deeper mid-vein. *Pedicels* 1—1.3 cm. long, very slender. *Perigone:* tepals oblong-lanceolate, bluntly acute, 5—6 mm. long, 3 mm. wide. *Stamens:* filaments 6 mm. long, widening below and united into a short staminal cup; anthers less than 1 mm. long at anthesis. *Ovary* 3-lobed, 2 mm. long, 2 mm. in diam., 6-crested, style 4 mm. long; stigma undivided.

Range.—Mexico, State of Nuevo Leon, about 30 mi. north of Monterrey. Flowering in November.

Notes.—This species is named for Dr. Marion Ownbey, the well-known worker on the North American Alliums. It differs from all of the other species in the subsection *Mexicana* in the wider, shallowly canaliculate sometimes somewhat spirally twisted leaves which are denticulate on the margins, and on the ridges on the back; the flattish to angled scape, denticulate on the ridges, the late flowering period, and in other particulars.

12. **Allium rhizomatum Wooton & Standley, in Contr. U. S. Nat. Herb. 16: 114. 1913; Traub, in Plant Life 23: 92. 1967.**

Description.—See Plant Life 23: 92. 1967.

Notes.—This species differs from the other rhizome-bearing species in that the rhizomes are scaly.

13. **Allium elmendorfii M. E. Jones ex Ownbey, in Res. Stud. State Coll. Wash. 18: 218—219. 1950; "Allium elmendorii" M. E. Jones, in Contrib. West. Bot. 18: 20. 1935, anglise; Traub, in Plant Life 23: 90. 1967.**

Description.—See Plant Life 23: 90. 1967.

Range.—South Texas.

Notes.—Distinguished from all others in the subsection *Mexicana* by the short-stalked bulblets borne at the base of the bulb.

14. **Allium michoacanum Traub.**

Bulb very small: 6 mm. long, 4 mm. in diam.; coats membranous, increasing by bulblets borne terminally on slender rhizomes. *Leaves* 2—3, very narrow, sheathing below to form a narrow deciduous neck, to 4 cm. long, 2 mm. in diam.

Range.—Collected by Dr. T. M. Howard (H 67-74A) on Mexican Highway 15. K. 233, east of Morelia, Michoacan, in mountains.

Notes.—This is apparently among the smallest of the Mexican Alliums.

15. **Allium fantasmosense Traub, sp. nov.**

Bulba ovoidea, tunicis membranaceis, bulbellas terminales in rhizomis producta; foliis usque ad 5, usque ad 32 cm. longis et 4 cm. latis, infra usque ad 7 cm. vaginatis; scapo gracili 14—18 cm. longo; spatha lanceolata; umbella 9—11-flora; pedicellis angustissimis; tepalibus 5 mm. longis 2 mm. latis; staminibus 4 mm. longis; stylo 4 mm. longo.

Holonomenifer: Traub 1076 (TRA), 10-12-67, grown at La Jolla, Calif., from stock collected by Dr. T. M. Howard, Aug. 5, 1967 (Howard 67-87A), San Luis Potosi, Valle de los Fantasmos, Mexican Highway 85.

Bulb ovoid, 1.5 cm. long, 1 cm. in diam.; coats membranous with sparse vertical fibers, forming bulbs at the end of slender rhizomes. *Leaves* 4—5, linear, canaliculate, up to 32 cm. long, 3—4 mm. wide, sheathing below to form a deciduous neck, 4—7 cm. long, 2.5—3 mm. in diam. *Scape* slender, somewhat angled in lower half, subterete above, 14—18—(24—28) cm. long, 3 mm. in diam at the base, narrowing gradually above to 1 mm. in diam. *Spathe* monophyllous, membranous, 1.3 cm. long *Umbel* 11—16-flowered, flowers light brownish-red (mahogany). *Pedicels* very slender, 1.2—1.9—2.6 cm. long, 0.25 mm. in diam. *Perigone:* tepals spreading, lanceolate, 5.5 mm. long, 2 mm. wide, acute. *Stamens* as long as or slightly longer than the tepals; filaments filiform, 5.5 mm. long, widening below and united into a short staminal cup; anthers 0.5 mm. long at anthesis; pollen ash gray. *Ovary* 2.5 mm. long, 2 mm. in diam., very obscurely 6-crested, with nectary glands on the sides of the ovary opposite the three petepals; style 2.5 mm. long after anthesis, stigma undivided.

Range.—Collected by Dr. T. M. Howard (67-87A), in the Valle de los Fantasmos San Luis Potosi, Mexico. Mexican Highway 85, alt. 2,896 m. Flowers in August-September.

Notes.—Named for its native habitat, the Valle de los Fantasmos. This species can be easily distinguished from *Allium glandulosum*, a much taller plant, by the narrow, canaliculate leaves, the somewhat angled to subterete scape, fewer-flowered umbel, the very slender pedicels, smaller flowers, and other features.

16. Allium sp. (Howard 67-87B).

Differs from the preceding species in having flat leaves, and in other particulars.
Range.—Mexico: San Lusi Potosi, Valle de los Fantasmos.

17. Allium durangoense Traub, sp. nov.

Bulba parva, tunicis membranaceis; foliis 3—5 angustis spiraliter contortis infra vaginatis; scapo centrali terete; spatha lanceolata; umbella centripetali 9—23-flora; floribus campanulatis usque ad substellatis albis, costa media rubella; pedicellis 1.8—2.5 cm. longis; staminibus styloque quam tepalibus brevioribus; ovario 6-cristato, capsula obscure cristata; seminibus pro ratione parvis nigris.

Holonomenifer: No. 1069 (TRA), grown at La Jolla, Calif. 7-14-67, from bulbs collected by Dr. T. M. Howard, 65-41, east of the City of Durango, Dur., Mex., July 11, 1965. Paranomenifer specimens: Traub Nos. 1070, 1072 and 1073 (TRA).

Plant slender, delicate. *bulb* globose to ovoid, 1.2—1.5 cm. long, 1—1.2 cm. in diam.; bulb coats white with sparse vertical fibers, producing flowering-sized bulbs on lateral rhizomes, up to 13 cm. long, 3 mm. in diam., the old bulbs persisting. *Leaves* 3—4—5, upright, narrow, canaliculate, rounded on the under side, spirally twisted, (4—12)—16—21—28 cm. long, 2—2.5 mm. wide, light green, acute sheathing below to form a narrow deciduous neck, 7—7.5—8 cm. long, 2.5—3 mm. in diam., brownish in lower ⅛ to ½. *Scape* central, terete, very slender, 21—26—28 cm. long, from top of deciduous neck, 2—2.25—2.75 mm. in diam, green, ultimately overtopping the longest leaves. *Spathe* monophyllous, lanceolate, closed at first, whitish, translucent, with 4—5 vertical nerves, 1.7 cm. long, soon rupturing at one side by the pressure of the expanding pedicels and pedicels, finally disposed to one side. *Umbel* centripetal, loose, flattish on top, 9—21—23-flowered; perigone very broadly campanulate to almost stellate; tepals whitish, keeled reddish-brown; ovary pinkish, with slight alliaceous scent. *Pedicels* slender, 1.8—2—2.5 cm. long, mostly curved outward and upward, green, 1 mm. in diam. *Perigone:* tepals elliptic acute; setepals 8 mm. long, 3.5 mm. wide; petepals 8 mm. long, 3 mm. wide. *Stamens:* filaments 5 mm. long, white, filiform, slightly dilated at the base, and united into a short staminal cup; anthers introrse, purplish, 1 mm. long before anthesis, shrinking to 0.5 mm. long after anthesis, pollen dark grayish. *Ovary* pink, 3-lobed 6-crested on top, style white, filiform, very short at first, elongating to 4 mm. after anthesis, stigma very minutely capitate. *Capsule* trigonous, 4 mm. high, 5 mm. in diam., seeds relatively small, roundish on one side, angled on two sides, pointed at one end, 1.75 mm. long, 1.75 mm. in diam., dull black.

RANGE.—East of the City of Durango, Dur., Mexico, in the plateau, grassy pastures, Mexican Highway 40, K 855 and 870. Collected by Dr. T. M. Howard in 1965 and 1967.

NOTES.—*Allium durangoense* is a very distinct species; the plant is slender, delicate, with spirally twisted leaves; the scape ultimately overtopping the longest leaves, the flower is whitish with a contrasting pinkish ovary. In dried specimens the leaves are usually very much shrunken so that it is difficult to distinguish the spirally twisted leaves except by magnification.

18. **Allium subteretefolium** Traub.

Bulb ovoid, bearing bulblets terminally on long rhizomes. *Leaves* 3—4, very slightly channeled on top, rounded below, giving the appearance of being terete, 41—55 cm. long, 3.5 mm. in diam., light green, glabrous, sheathing below to 5 cm. to form a deciduous neck.

RANGE.—Collected by Dr. T. M. Howard (H 66-3A), San Luis Potosi, Mexico.

NOTES.—This species differs from all others in the subsection *Mexicana* in the very long subterete leaves.

SECTION **RHOPHETOPRASON** TRAUB

Section Rhophetoprason Traub, Sect. nov. genus Allium L. (Amaryllidac.); in Plant Life 23: 110. 1967, anglise.

Tunicae bulborum membranaceae, fibris sparsis verticalibus; plantae per semines et bulbas florentimodas in rhizomis lateralibus reproductae, bulbis vetustis non persistentibus; foliis 4—5 vel pluribus infra prominente vaginatis. Typus: Allium glandulosum Link & Otto

19. **Allium glandulosum** Link & Otto, Ic. Pl. Rar. Hort. Berol. 1: 33, pl. 17. 1841; Ownbey, Res. Stud. State Coll. Wash. 15: 224-225. 1947; ibid. 18: 219-220. 1950; Traub, Plant Life 23: 92-94. 1967.

Syn.—"Allium longifolium Lindl." (misapplied name), in Bot. Reg. 12: pl. 1031. 1826-27, non (H.B.K.) Spreng. 1825.

DESCRIPTION.—See Plant Life 23: 92-94. 1967.

RANGE.—Plants have been collected in the State of Hidalgo, Mexico; and in southern Honduras. In 1966, Dr. Howard collected a form of this species in the State of San Luis Potosi.

NOTES.—*Allium glandulosum* is related to *A. longifolium* in the method of vegetative reproduction (see Fig. 26), but differs from it in the relatively less thicker, and shorter leaves, the flattish, striated scape, and the usually many-flowered umbel of brownish-red (mahogany) sweet (honey) scented flowers, the copious nectar produced; the crestless ovary, and other particulars.

Under optimum culture, *A. glandulosum* may produce from 4 to 5 side sprouts, besides the main shoot, from 2—3 of the side sprouts may produce flower scapes. This is in addition to the 2—3 flower scapes produced from the main shoot. In nature, this apparently does not happen, but it may be that two central scapes may be produced from the main shoot. If plants approximating those in nature are desired under culture, it is advisable to apply fertilizer sparingly.

It is desirable to store the dormant bulbs in dry sand or sandy soil, and to plant them from mid-May to mid-June in a sandy, well-drained soil.

20. **Allium longifolium** (H.B.K.) Spreng. **emend.** Spreng., in Syst. Veg. 2: 38. 1825.

Syn.- *Schoenoprasum longifolium* H.B.K., Nov. Gen. et Sp. Pl. 1: 277. 1816; Plant Life 23: 60. 1967.

LECTONOMENIFER: Humboldt & Bonpland, without number, Herb. Mus. Nat. Hist. Phaner. Paris (P), near Queretaro, Aroyozarco and San Juan del Rio, Mex. alt. 1,856 m. flowering in Aug. (see Fig. 27 for photocopy).

Recent verifying specimens: T. M. Howard 67-35 (TRA 1073), 1 mi. w. Magdalena, Jalisco, Mex. July 26, 1967; and Traub 1075(TRA), grown at La Jolla,

Calif. Sept. 10, 1967, from bulbs collected by Dr. T. M. Howard, near Tuxpan, Michoacan, July 1, 1964 (Howard 64-57A).

Bulb ovoid, 2.5 cm. long, 1.5 cm. in diam.; bulb coats white, membranous, with sparse vertical fibers; producing 2 or more flowering-sized bulbs on lateral rhizomes, the old bulb not persisting. *Leaves* 3—4—5, very long, thick, 32—41—52 cm. long (to 49—64 cm. long under optimum culture), 3—4.5 mm. wide, deeply channeled, rounded on the back, vascular bundles in one row, gradually narrowing to the acute apex, sheathing below to form a long deciduous neck, 4—4.5 cm. long (7—25 cm. long under optimum culture), 8—10 mm. in diam. *Scape* central, terete, 40—47 cm. long (to 55 cm. long under optimum culture), 4 mm. in diam. where it emerges from the deciduous neck, gradually narrowing to 1.5 mm. in diam. at the apex. (Under optimum culture 1 or 2 side shoots with scapes somewhat smaller may be produced.) *Spathe* lanceolate, membranous, 1.5 cm. long, 5 mm. in diam., vertically 4-nerved. *Umbel* 6—12-flowered under optimum culture 8—10—28-flowered; perigone very pale lavender, almost white, tepals with lavender midribs, spreading to very broadly campanulate; stamens, filaments pale lavender, pollen light lavender, style light lavender; flowers with slight alliaceous scent. *Pedicels* slender, 1.5—1.7—2.5—3 cm. long (under optimum culture, 1.5—2—2.3—3.3 cm. long). *Perigone* tepals oblong, acute, 9 mm. long, setepals 4 mm. wide, petepals 3 mm. wide. *Stamens*: slightly shorter than the style, filaments 7 mm. long, dilated below, and united into a short staminal cup; anthers 2 mm. long, shrinking to 1 mm. long at anthesis; pollen light lavender. *Ovary* 2 mm. long, 2 mm. in diam., obscurely 6-crested; style 5 mm. long, shorter than the tepals; stigma undivided; nectaries on the sides of the ovary opposite the 3 petepals, but nectar is sparse as compared with that in *A. glandulosum*. *Capsule* trigonous, 4 mm. long, 5 mm. in diam.

Range.—Living material collected by Dr. T. M. Howard in red clay soil, cornfield, by roadside, between Zitacuaro and Ciudad Hidalgo, near Tuxpan, Michoacan, Mexican Highway 15, July 2, 1957 and July 1, 1964 (Howard 57-11B And Howard 64-57A); and 1 mi. west of Magdalena, Jalisco, Mexican Highway 15, in heavy clay soil, July 25, 1967 (Howard 67-35).

Notes.—*Allium longifolium* is related to *A. glandulosum* in the method of vegetative reproduction, but differs from it in the very long leaves, the terete scape, the fewer flowers in the umbel, in the production of less nectar, the obscurely 6-crested ovary, the slight alliaceous scent of the flowers, and in other particulars.

One male-sterile seedling was observed under cultivation; the plant has shorter leaves, the umbel is 8-flowered; the flowers are purplish, with deeper tepal midribs, and do not open widely.

"

From the original description of *Allium longifolium* it appears that the species was collected near *Queretaro*, *Arroyozarco* and *Juan del Rio*. It is argued that there must have been at least two specimens. For no apparent valid reason, some American workers have *erroneously* referred the one known specimen (Fig. 27) to *Nothoscordum bivalve*, and would leave matters in this confused state for another century and a half in spite of the fact that the known specimen (Fig. 27) matches up with plants collected in the wild by Dr. Howard. Since H.B.K. did not indicate a holonomenifer, the known specimen is designated the lectonomenifer.

ORIENTATION OF VASCULAR BUNDLES IN **ALLIUM** LEAVES

HAMILTON P. TRAUB

For some time it has been recognized that data on the orientation of vascular bundles in the leaves might be of diagnostic value in the grouping of *Allium* species (Feinbrun, 1954; Mann, unpublished notes). To encourage research in this field, methods of preparing material are suggested. Brief summaries of observations on vascular bundles of foliage leaves (Mann, unpubl. notes) and on chromosome numbers (Cave, et al. 1956-1964; Ornduff, 1967; Tutin, 1957) are given. In the tabulation, species are grouped as proposed by Traub (1968).

MATERIALS AND METHODS

PERMANENT SLIDES.[1] The best means to demonstrate the arrangement of vascular bundles requires glass slide preparations from material fixed, embedded, and then cut on the microtome. For this purpose Mann fixed leaf pieces in Craf III (Sass, 1951). Soft material was embedded in water soluble carbowax (polyethylene glycol) (Riopel and Spurr, 1962) and hard material in tissuemat by the well-known tertiary butyl alcohol method (Johansen, 1940). For both procedures sections were stained in hematoxylin. Carbowax-embedded material to be photographed was mounted temporarily in water. This gave beautiful preparations free of distortion, plasmolysis, and cell wall shrinkage. These slides were made semi-permanent by drawing off the water, mounting the sections in glycerine jelly (Johansen) and ringing the cover glasses with an air-tight cement such as Duco.[2] Sections mounted in this manner suffer some distortion and are not suitable for photographs but can be used for microscope study and for making camera lucida drawings.

HERBARIUM SECTIONS. To survey bundle orientation in a large number of species, a simpler, more rapid technique is required. Dried leaf sections serve this purpose, and the preparations can be permanently attached to the appropriate herbarium sheets. This technique is not a replacement for glass slides but is a useful method for preliminary observation.

Very thin cross-sections of leaves are cut free hand with a sharp knife or razor blade. A rectangle about 6 cm. x 8 cm. of moisture permeable cellulose acetate film (DuPont brand, thickness 200-ca-43) (Traub, 1950, 1951) is wetted on one side with water, the sections arranged in order, and a second rectangle of cellulose acetate film placed over the sections so they are tightly held in place. The preparation is placed between pieces of blotting paper about 8 cm. x 10 cm., labelled, and pressed. A discarded book suitably weighted works well. When the sections

1 The procedure for making permanent slides has been contributed by Miss Dora G. Hunt, Department of Vegetable Crops, University of California, Davis.
2 E. I. du Pont de Nemours & Co., Wilmington, Delaware.

Table. **Allium** L. species: observations on vascular bundles in foliage leaves and chromosome numbers. Grouping according to Traub (1968).
Abbrev.—**canal.** = canaliculate; **flattd.** = flattened; **sl.** = slightly

Lineagic category	Basic chromosome number (x)	Vascular bundles number	rows orientation	Foliage leaf blade shape of X-section
Subgenus I. AMERALLIUM (x=7 except a few x_2=8, x_3=9)				
Sect. I. **CAULORHIZIDEUM**				
A. brevistylum S. Wats.	2n=14	1		broadly canal.
A. gooddingii Ownb.	2n=14	1		broadly canal.
A. validum S. Wats.	2n=—, 28, 56	1		broadly canal.
Sect. II. **AMERALLIUM**				
Subsect. I. **MEXICANA**				
A. scaposum Benth.	2n=?	1; 2 bundles at mid-vein		half terete
Subsect. II. **CANADENSIA**				
A. macropetalum Rydb.	2n=14	1	(circle)	terete
A. canadense L.	2n=14, 28	1		shallowly canal.
A. drummondii Regel.	2n=14, 28	1		shallowly canal.
A. plummerae S. Wats.	2n=14, 28	1; 2 bundles at mid-vein		shallowly canal.
A. textile Nel. & Macbr.	2n=14, 28	1		shallowly canal.
A. geyeri S. Wats.	2n=14, 28, 42	1		shallowly canal.
Sect. III. **LOPHIOPRASON**				
Subsect. I. **CERNUA**				
A. sp. (near **obtusum**)	2n=?	1		furrowed
A. stellatum Fras. ex Ker-Gawl	2n=14	1		furrowed
A. haematochiton S. Wats.	2n=14	1		furrowed
A. californicum Rose	2n=14	1; 2 bundles at mid-vein		thick
Subsect. II. **FALCIFOLIA**				
A. douglasii Hook	2n=14	1		canal.
A. madidum S. Wats.	2n=14, 42	1		canal.
A. nevii S. Wats.	2n=14	1		canal.
A. tolmiei Bak.	2n=14	1		canal.
A. anceps Kell.	2n=14	1		canal.
A. siskiyouense Ownb.	2n=14	1		flat
A. fibrillum Jones	2n=14	1		flat
A. persimile (Ownb.) Traub	2n=14	1		canal.
A. crenulatum Wieg.	2n=—, 42	1		canal.
A. platycaule S. Wats.	2n=14	1; 2 bundles at mid-vein		canal.
Subsect. III. **SANBORNIANA**				
A. fimbriatum S. Wats.	2n=14	1 irregular (or 2?)		flat
Subsect. IV. **ACUMINATA**				
A. amplectans Torr.	2n=14	2-3	(circle)	terete, solid
A. hyalinum Curr. ex S. Wats.	2n=14, 21	1		furrowed
Subsect. V. **CAMPANULATA**	2n=14	1		half terete
A. campanulatum S. Wats.	2n=14, 28	1		canal.
A. bisceptrum S. Wats.	2n=14	1		canal.
Subsect. VI. **BOLANDERIANA**				
A. bolanderi S. Wats.	2n=14	1		half terete
Sect. IV. **RHOPHETOPRASON**				
A. glandulosum Link & Otto	2n=—, 28	1		thick, sl. canal.
Sect. V. **MOLIUM**				
A. neapolitanum L.	2n=14	1		flat, sl. keeled
A. subhirsutum L.	2n=14	1		flat, curved
A. roseum L.	2n=16, 32	1		flat, curved
A. zebdanense Boiss. et Noe	2n=18	1		flat, v. thick mid-vein
Sect. VI. **XANTHOPRASON**				
None studied				
Sect. VII. **CHAMAEPRASON**				
A. chamaemoly L.	2n=?	1		flat
Sect. VIII. **OPHIOSCORODON**				
Subsect. I. **URSINA**				
A. ursinum L.	2n=14	1		keeled, nearly triangular

Subsect. II. **TRIQUETRA**				
A. triquetrum L.	2n=18	1;3 bundles at keel		triangular
Subgenus II. **NECTAROSCORDUM** $x_2=8$				
Sect. IX. **NECTAROSCORDUM**				
A. bulgaricum (Janka) Prodan	2n=?	1		flat
Subgenus III. **ALLIUM** ($x_2=8$, except a few x=7?, $x_3=9$, $x_4=10$)				
Sect. X. **RHIZIRIDEUM**				
A. tuberosum Rott. ex Spreng.	2n=16, 32	2, opposed		flat, thick
Sect. XI. **MELANOCROMMYUM**				
A. affatuense B. Fed.	2n=16	2, opposed		flat, sl. curv.
A. nigrum L.	2n=16	2, opposed		flat, sl. curv.
Sect. XII. **CODONOPRASON**				
A. oleraceum L.	2n=—, 32, 40	2, opposed		flat, sl. curv., thick 7 canal.
Sect. XIII. **PETROPRASON**				
A. polyphyllum Kar. et Kir.	2n=—, 32	2, opposed		flat
Sect. XIV. **ALLIUM**				
A. ampeloprasum L.	2n=16, 32	2, opposed		flat, keeled
A. sativum L.	2n=16, 48	2, opposed		flat, keeled
Sect. XV. **HAEMOPRASON**				
None studied				
Sect. XVI. **MICROSCORDUM**				
None studied				
Sect. XVII. **ANGUINUM**				
A. tricoccum Ait.	2n=—, 32	2, opposed		furrowed
Sect. XVIII. **CEPA**				
Subsect. I. **FISTULOSA**				
A. fistulosum L.	2n=16	1 (circle)		fistulose, circ.
Subsect. II. **SCHOENOPRASA**				
A. schoenoprasum L.	2n=16, 32	1 (circle)		fistulose, sl. angled
Subsect. III. **POPOVIANA**				
A. chinense G. Don	2n=—, 24,32	1 (circle)		fistulose, 3-5-angled
Subsect. IV. **CEPA**				
A. galanthum Kar. et Kir.	2n=16	1 irreg. (or 2?) (circle)		fistulose, flattd.
A. cepa L.	2n=16, 32	1 irreg. (or 2?) (circle)		fistulose; often flattd. on one side

are dry, the edges of the film are stapled together and the preparation attached to the herbarium sheet. Some sections can be examined satisfactorily without magnification.

OBSERVATIONS

In the grouping of *Allium* species in the accompanying table, there appears to be a significant relation between vascular bundle orientation and basic (x) chromosome number. With 2 exceptions the species under subgenus *Amerallium* have the basic x=7 chromosome number, and with few exceptions, the foliage leaves in transverse section have essentially one row of vascular bundles normally oriented, i. e., phloem on the lower, xylem on the upper side of the leaf. Species having one row plus 2 or 3 bundles at the mid-vein are probably variations of the single row form.

The subgenus *Nectaroscordum*, with the basic x=8 chromosome number, is separated from the other two subgenera by the discoidally

swollen pedicel apex, and the floral tepals 3—7-nerved. In the one species studied, the leaf vascular bundles are oriented in one row as in the subgenus *Amerallium*.

Species in subgenus *Allium* so far as reported here are uniform in having the basic $x_2=8$ chromosome number and in having leaf vascular bundles arranged in either 2 opposing rows or a circle.

Further understanding of relationships among the species of *Allium* awaits additional studies from many approaches such as the anatomical, morphological, genetical, and chemical.

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Postscript.—On further consideration, in the above article, and the one following (Traub, 1968), it appears that the Sections **Xanthoprason** and **Chamaeprason** should be reduced to subsections under Section V. Molium (see pages 144 and 161) since the differences are not sufficient for maintaining them on the sectional level:

Section V. **Molium** Endl. (1836)

Subsection I. **Neapolitana** (nomenifer: **A. neapolitanum** L.)

Subsection II. **Moliana** (nomenifer: **A. moly** L.)
Syn.-Section **Xanthoprason** F. Hermann

Subsection III. **Chamaemoliana** (nomenifer: **A. chamaemoly** L.) Syn.-Section **Chamaeprason** F. Hermann

THE SUBGENERA, SECTIONS AND SUBSECTIONS OF **ALLIUM** L.

HAMILTON P. TRAUB

I. INTRODUCTION

The genus *Allium* L. is among the more difficult groups in the *Amaryllidaceae*. It comprises a great, wide-ranging phylon in the North Temperate Zone; one very hardy species, *Allium schoenoprasum*, ranges even into the arctic. More than 600 species are recognized. The subtle differences in living plants are lost more or less in dried specimens. They are at once much *alike* to the uninitiated and yet quite distinct to the student who knows them as *living* plants.

The ideal procedure in the study of such plants is to preserve dried specimens and at the same time collect living material for more detailed study in the greenhouse or experimental garden. An adequate sample of living plants in each case should also be turned over to the caryologist for determining the chromosome complement. A dried specimen with the chromosome data added should then be deposited in the amaryllid herbarium maintained by such an organization as the American Plant Life Society where it can serve as a permanent reference source.

ALLIUMS AS A WHOLE, 1753-1875

Linnaeus (1753) recognized 31 *Allium* species. The Alliums were first placed under subgeneric groups by George Don (1827), who arranged 129 species under eleven divisions which were placed under seven sections as shown in Table 1.

Table 1. The sections of **Allium** according to G. Don (1827).

Porrum (Divs. I & II)	Molium (Divs. VIII & IX)
Schoenoprasum (Div. III)	Anguinum (Div. X)
Macrospatha (Divs. IV, V & VI)	Ornithogalodeum (Div. XI)
Rhizirideum (Div. VII)	

Since 1827, additional sections have been proposed by other workers. Regel (1875) grouped 262 *Allium* species under six sections as shown in Table 2.

Table 2. The sections of **Allium** according to Regel (1875).

Porrum	Macrospatha
Schoenoprasum	Molium
Rhizirideum	Nectaroscordum

In the contributions of G. Don and Regel it is understandable that the North American *Allium* species were inadequately represented. Only a minor part of the North American species had been discovered, and the available herbarium material of the known species was meagre. After 1875, the study of the genus *Allium* was fragmented by being included only in various regional and local floras.

OLD WORLD ALLIUMS, 1876-1967

When Edmond Bossier published his "Flora Orientalis" (Bossier, 1882), including the area from Greece and Egypt to the boundaries of

India, he recognized a total of 141 *Allium* species for this region. J. D. Hooker published his "Flora of British India" in 1892, which included the treatment of the Alliums for this restricted area.

Victor Janka (1886) provided a key to the Alliums of Europe, and F. Hermann (1939) proposed sectional and subsectional names for the genus *Allium* in Europe, some of which are synonyms for groups proposed earlier.

Vvedensky (1935) grouped 228 *Allium* species of the U. S. S. R. under nine sections as shown in Table 3.

Table 3. The sections recognized for the Alliums of U. S. S. R., according to Vvedensky (1935). See also the English translation by Airy-Shaw, 1944 (1946).

1. Anguinum G. Don (1827)
2. Ophioscorodon (Wallr.) Endl. (1836)
3. Rhizirideum G. Don (1827)
4. Phyllodolon (Salisb.) Prokh. (1931)
5. Cepa (Moench) Prokh. (1931)
6. Haplostemon (Boiss.) Halaczy (1904)
7. Porrum G. Don (1827)
8. Caloscordum (Herb.) Bak. (1874)
9. Nectaroscordum (Lindl.) Gren. et Godr. (1855)

Thus matters stood, when Stearn (1936) published a bibliographical note on Don's 1827 "Monograph of the Genus *Allium*." Interest in Alliums was further stimulated when, in 1944, Volume 11, of Herbertia (published in 1946) was devoted almost entirely to the genus. The Herbertia symposium included among other contributions, Airy-Shaw's translation from the Russian into English of Vvedensky's "Genus Allium in the U. S. S. R. (1935)", with corrigenda by W. T. Stearn. The following named papers were contributed by Stearn: "The Floristic Regions of the U. S. S. R. with reference to the Genus *Allium*," "Nomenclature and Synonymy of *Allium odorum* and *A. tuberosum*"; a translation into English of Janka's "Key to the Alliums of Europe"; and "Notes on the Genus *Allium* in the Old World." In connection with the discussion in the last named article, Stearn suggested a provisional list of 14 sections to accomodate the *Allium* species as shown in Table 4.

Table 4. Stearn's provisional list of sections for the genus **Allium** (Stearn, 1944 (1946)).

1. **Melanocrommyum** Webb et Berthl. (1848)
   (nomenifer: **A. nigrum** L.)
2. **Moly Endl.** (1836)
   (nomenifer: **A. neapolitan** L.)
3. **Briseis** (Salisb.) Stearn (1946)
   (nomenifer: **A. triquetrum** L.)
4. **Microscordum** Maxim. (1887)
   (nomenifer: **A. monanthum** Maxim.)
5. **Chamaeprason** F. Hermann (1939)
   (nomenifer: **A. chamaemoly** L.)
6. **Xanthoprason** F. Hermann (1939)
   (nomenifer: **A. moly** L.)
7. **Ophioscorodon** (Wallr.) Endl. (1836)
   (nomenifer: **A. ursinum** L.)
8. **Cepa** (Moench) Prokh. (1931)
   (nomenifer: **A. cepa** L.)
9. **Phyllodolon** (Salisb.) Prokh. (1931)
   (nomenifer: **A. fistulosum** L.)
10. **Haemoprason** F. Hermann (1939)
    (nomenifer: **A. melanantherum** Panc.)
11. **Codonoprasum** (Rchb.) Endl. (1836)
    (nomenifer: **A. oleraceum** L.)
12. **Rhizirideum** G. Don ex Koch (1837)
    (nomenifer: **A. senescens** L.)
13. **Anguinum** G. Don ex Koch (1837)
    (nomenifer: **A. victorialis** L.)
14. **Alliotypus** Dumort. (1827)
    [=**Allium**]
    (nomenifer: **A. sativum** L.)

In the following volume of Herbertia, Stearn (1945) published a revised and supplemented version of Hooker's "The Alliums of British India." In 1955, Stearn published a plate on *Allium bulgaricum* in Botanical Magazine. Later, Stearn (1960) published "*Allium* and *Milula* in the Central and Eastern Himalaya," in which he proposed

new *Allium* species, and reported the presence of the alliaceous smell in *Milula*; evidence of its affinity with *Allium*.

NORTH AMERICAN ALLIUMS, 1876-1967

At the turn of the century, M. E. Jones (1902) recognized that the North American Alliums should be placed in natural groups. He attempted to establish the "Reticulatum Group" centering around *Allium reticulatum* G. Don (1827) = *Allium textile* Nelson & Macbr. (1913). It was not until 1955 that Ownbey stated that the North American *Allium* species with the basic x=7 chromosome number are to be placed in nine alliances (Ownbey & Aase, 1955). In the same paper the species belonging to one of these, the Allium Canadense Alliance, were described. The other alliances were not named. The number of alliances was later reduced to eight (Ownbey, 1966), as shown in Table 5.

Table 5. Alliances of North American **Allium** species with the basic x=7 chromosome number according to Ownbey (1966).

1. Acuminatum Alliance
2. Campanulatum Alliance
3. Canadense Alliance
4. Cernuum Alliance
5. Falcifolium Alliance
6. Kunthii Alliance
7. Sanbornii Alliance
8. Validum Alliance

In order to bring the grouping of the North American Alliums, with the basic x=7 chromosome number, on a coordinate basis with the sections of Old World Alliums, Traub (1967) grouped the species under four sections, including subsections under two sections. Ownbey's Alliances were incorporated in the process by elevating them to subsectional rank as shown in Table 6.

Table 6. The sections and subsections of North American **Allium** species, with the basic x=7 chromosome number, according to Traub (1967, pp. 67; 89-95, 110). Later subsect **Bolanderiana** was added, Traub, 1968b.

Section I. **CAULORHIZIDEUM** Traub (nomenifer: **A. validum** S. Wats.)
Section II. **AMERALLIUM** Traub (nomenifer: **A. canadense** L.)
  Subsection I. **Mexicana** Traub (nomenifer: **A. mexicanum** Traub)
  Subsection II. **Canadensia** Ownbey ex Traub (nomenifer: **A. canadense** L.)
Section III. **LOPHIOPRASON** Traub (nomenifer: **A. sanbornii** Wood)
  Subsection I. **Cernua** Ownbey ex Traub (nomenifer: **A. cernuum** Roth)
  Subsection II. **Falcifolia** Ownbey ex Traub (nomenifer: **A. falcifolium** Hook & Arnott)
  Subsection III. **Sanborniana** Ownbey ex Traub (nomenifer: **A. sanbornii** Wood)
  Subsection IV. **Acuminata** Ownbey ex Traub (nomenifer: **A. acuminatum** Hook.)
  Subsection V. **Campanulata** Ownbey ex Traub (nomenifer: **A. campanulatum** S. Wats.)
  Subsection VI. **Bolanderiana** Traub (nomenifer: **A. bolanderi** S. Wats.)
Section IV. **RHOPHETOPRASON** Traub (nomenifer: **A. glandulosum** Link & Otto)

II. THE GENUS ALLIUM AS A WHOLE, 1968

The following discussion is concerned with the background for the arrangement of the North American and Old World Alliums on a coordinate basis, including a consideration of (a) the phytogeography or distribution of the genus *Allium* and allied genera; (b) the center of origin of the genus *Allium;* (c) evolution in the genus *Allium:* and (d) the grouping of the species under subgenera, sections and subsections.

DISTRIBUTION OF ALLIUM AND ALLIED GENERA

It has been pointed out by Wulff (1943) that the present distribution of any species is a reflection of the geological revolutions and cli-

matic changes which have occurred on earth during the entire period of its existence. According to Polunin (1960) and S. A. Cain (1944), the vegetation of the aerial parts of the earth tended to be widely comparable in different regions during the earlier geological ages up to and including the Mesozoic, but this relative uniformity was not maintained through the Cenozoic. Marked local changes in conditions were taking place, particularly from the Miocene (beginning 25 million years ago) onwards, and these changes are reflected in the fossil record. These are of great significance in connection with the problem of the origin of the existing floras. However, fossils of monocots are relatively scarce as compared with those of the dicots. *Allium* fossils have not been found, and reliance has to be placed on the distribution of floras in general of which the Alliums are a part.

During the later Cenozoic Era (about 25 to 1 million years in the past) Bering Strait was bridged by a mountain range which apparently had a fairly mature topography which facilitated a general migration of plants and animals over the northeastern Siberian-Alaskan land bridge to North America. Floras were thus practically circumpolar and circumboreal in distribution and were generally spread over the Northern Hemisphere. It is reasonable to assume that along with other plants, the *Allium* species and those of allied genera also had a similar distribution. These included *Milula, Hesperocallis* and most likely other now extinct primitive genera, as well as *Allium*, and other more advanced *Allieae* still existing—*Nothoscordum, Leucocoryne, Tulbaghia, Tristagma, Agapanthus*, and the genera in the Tribe *Gilliesieae*. The circumpolar and circumboreal distribution of *Allium* is corroborated to some extent by the present extensive boreal and arctic range of *Allium schoenoprasum* from Eurasia to North America.

However, the oncoming of the colder conditions with the Pleistocene inter-glacial period, from 1 million to about 15 thousand years in the past in Eurasia and North America, apparently exterminated many of the plants in Eurasia, including practically all of the more primitive *Allium* allies due to being forced against the high east-west mountain ranges to the south. The genus *Milula* was apparently the sole survivor among *Allieae* relicts in Tibet and Nepal, and *Allium* species most likely were drastically reduced in number.

In North America, according to this hypothesis, the plants were also forced southward during the inter-glacial period, but the north-south direction of the mountain ranges facilitated fairly free migration southward of many plant species, including the *Allieae*. It is probable that during this time some of the more primitive genera, not particularly adapted to the new conditions, could have been exterminated, excepting the primitive genus *Hesperocallis* which survives as a relict in southwestern United States.

With the return of more equable conditions following the inter-glacial period about 10 thousand years in the past, immigration northward took place. Thus, *Allium* species apparently returned to the

western mountain region in North America, and spread eastward over the plains and prairies, and the relatively low Appalachian highlands to the Atlantic Coast. One allied species, *Nothoscordum bivalve*, spread northward to the midland and eastward to the Atlantic Coast. These migrations are in line with the explanation of the marked similarity between the floras of eastern Asia and eastern North America, first observed by Asa Gray. For instance, a study of the floras of the Island of Yeso, lying north of the main island of Japan, discloses that more than 26 per cent of its plants are found also in North America. It should also be noted that in addition to *Allium schoenoprasum* which ranges from Eurasia to North America, Nothoscordum species are found in Siberia and Japan and also in the eastern United States.

The other allies of the genus *Allium*, including other species of *Nothoscordum, Leucocoryne, Tulbaghia, Tristagma, Agapanthus* and the *Gilliesieae*, apparently did not migrate northward again, apparently having already moved farther south via the Mexican—Central American —Andean highlands (boreal route) as far as Chile and Argentina. The explanation for the occurrence of *Tulbaghia* and *Agapanthus* in South Africa has not been found, and their presence there may possibly be due to the transfer of seeds from South America by birds. The cormous *Brodiaeioidinae* apparently are only distantly related to the *Alliceae*, and will not be considered here.

It should be noted that the genus *Allium* has only two surviving monotypic relict relatives—*Milula spicata* Prain (2n=?), in Tibet and Nepal; and *Hesperocallis undulata* A. Gray (2n=24), in southwestern United States. These relatively primitive *Allium* relatives are characterized by the marker of the alliaceous odor. Morphologically they are not closely similar to *Allium*, but *Milula*, with a scape and the flower spike subtended by a spathe, is nearer to *Allium*. *Hesperocallis*, with an elongated terminal raceme, may be reminiscent of the mutual ancestral plants which the *Amaryllidaceae* had in common with the *Liliaceae*. Since the relicts occur both in Asia and North America, this may be interpreted as introducing a complicating factor when the matter of the center of origin of *Allium* is considered. However, if interpreted in the light of the phytogeography of the groups concerned, as already explained, any difficulty should be minimized.

CENTER OF ORIGIN OF THE GENUS ALLIUM

Hulten (1937) has pointed out that it is "unsafe to assume that a plant (group) originates in the place where it has its most numerous relatives. In most cases such a consideration will perhaps be correct, but in others it must be misleading." In the present case, the most numerous *Allium* species are in Eurasia-North Africa with a lesser number in North America as has already been indicated. However, this apparently was not true immediately following the inter-glacial period when the floras of Eurasia had been decimated by being forced against the east-west mountain ranges to the south due to glaciation. It should also be indicated that the more numerous related genera are in South America

to South Africa, thus presenting a most unusual and complicated problem in plant distribution.

It is reasonable to assume that the distribution of *Allium* species was circumpolar and circumboreal before the inter-glacial period along with the rest of the plants of the Northern Hemisphere. Apparently the floras were drastically reduced during the inter-glacial period in Eurasia due to the east-west direction of the mountain ranges against which the plants were forced by the advancing glaciers, and were largely destroyed. Thus, the present *Allium* flora in this vast area would not be a fair index of what it was in early post-glacial times. The *Allium* species had to be replenished from a remnant after the glaciers had receded.

In North America, the *Allium* species apparently were not subject to such drastic reduction as already explained, and they would serve as a better index of what they were originally. More than 95 per cent of the species in North America have the basic x=7 chromosome number. Only two species with the $x_2=8$ basic number, *Allium schoenoprasum* (2n=16, 32) and *A. victorialis* (2n=16, 32), range from Eurasia to North America. The latter apparently has a common ancestry with the North American, *Allium tricoccum* Ait. (2n=—, 32). Thus, it appears that at the time of the oncoming of the inter-glacial period, most of the *Allium* species which had circumpolar and circumboreal distribution had the basic x=7 chromosome number. The secondary basic, $x_2=8$ had evolved from x=7, but apparently was not numerous among the *Allium* species.

In Eurasia-North Africa today the picture is reversed. *Allium* species with the basic x=7 chromosome number constitute only about 10 per cent of the more than 500 species. The rest (more than 88 per cent) practically all have the secondary basic $x_2=8$ number, with only a few having the tertiary basic $x_3=9$, and only two with the quadrinary basic $x_4=10$. How can this be explained?

Apparently, when the survivors from the inter-glacial onslaught began to multiply in Eurasia, the species with the $x_2=8$ basic number, derived from the more primitive x=7 species, moved into vast unpopulated areas, and apparently being better adapted to the new conditions, rapidly increased in proportion to the x=7 species, so that the proportions of the two have been reversed in comparison with those in North America.

On the basis of phytogeography as defined by Wulff (1943), it appears that the original basic chromosome number of *Allium* is x=7, which apparently originated from a now extinct ancestral stock with the basic x=6, which it had in common with such a related relict as *Hesperocallis undulata*, 2n=—, 24 (tetraploid).

The evidence from phytogeography appears to point to x=7 as the basic chromosome number in the genus *Allium* but this has to be considered further in connection with other available researches. A final decision can only be made after the evidence from chromosome studies.

chemistry, morphology and anatomy has also been evaluated in the following discussion.

EVOLUTION IN THE GENUS ALLIUM L.

Stearn (as quoted by Brat, 1965) has proposed the hypothesis that "the two groups, i.e., the New and Old World species, represent a case of parallel evolution from the proto-*Allium* which was of the rhizomatous kind and the purely bulbous forms, represent an adaptation to environments with a marked seasonal variation of the Mediterranean nature." This view is apparently true in so far as the ancestral stock from which the genus *Allium* originated was rhizomatous and the leaves were oblong and/or petiolate, and that species with bulbous rootstocks and sessile leaves, flat, solid terete, or fistulose, have evolved in response to particular climatic conditions. However, it is hardly possible that the New and Old World species had parallel evolution before the interglacial period when the floras of the North Temperate Zone had a circumboreal distribution. By that time, it appears that the secondary $x_2=8$ basic chromosome number had already evolved from the basic $x=7$ as evidenced by the presence in North America of (a) *Allium tricoccum* Ait. (2n=—, 32), a rhizomatous, petiolate-leaved species; (b) *Allium validum* S. Wats. (2n=—, 28, 56), an intermediate species, and (c) the more numerous truly bulbous species with flat, terete or furrowed leaves, with the basic $x=7$, basic chromosome number. Since the interglacial period, it is true that the New and Old World Alliums have had an independent development due to the barrier of geographical isolation, but not sufficient time has elapsed to produce really marked differences between the two segments. The North American $x=7$, and Old World Alliums, with *flat* leaves in the Section Molium, for instance, also with the basic $x=7$ chromosome number, usually have a single row of normally oriented vascular bundles and subepidermal laticifers in the leaf blades (Mann, unpubl. mss.; see also Traub, 1968). This surely does not point to parallel evolution of such important features. This leaf character had apparently been evolved before the land bridge between northeastern Asia and North America disappeared. Thus, any independent or parallel evolution of the New and Old World species, not influenced by reticulate hybridization, has to date from post interglacial times. Such developments as the production of flowering-sized terminal bulbs on rhizomes, the old bulb not persisting, as in *Allium glandulosum* and *A. longifolium*, from Mexico, show marked independent evolution, unless the derivation of these features from Old World ancestral stock could be proved. Similarly, the biennial habit of some domesticated forms of *Allium cepa* represent independent evolution under cultivation. Such a development has not been found in natural populations.

Within the genus *Allium*, as shown by the researches of Levan (1932, 1935), Levan and Emsweller (1939), and Mensinkai (1939), evolution is proceeding along three lines on the basis of caryological studies: (1) change in chromosome structure; (2) change in genotype, and (3) change in chromosome number.

CHANGE IN CHROMOSOME STRUCTURE

Structural chromosome changes as a mechanism for variation has relatively great significance and wide application in the evolution of organisms. Its main value lies in the production of rapid evolutionary changes. The chief drawback is that it may lead to sterility. In those cases where it has a high survival value, species evolution is rapid and marked. According to Mensinkai (1939), "Of these, inversions have played a prominent role in *Allium*, as judged from a study of the species . . . (studied). . . . Other changes, such as translocations, fragmentation, fusion, etc., have taken place in these species (which he studied cytologically), though less frequently."

CHANGE IN GENOTYPE

Mensinkai (1939) has reported on a decrease in size of the chromosome complement in *Allium decipiens* (2n=16), and *A. cyaneum* (2n=—, 32), and an increase in size of chromosomes in *A. margaritaceum* (2n=16, 32). He studied a diploid and a tetraploid race of the last named species.

Brat (1965) reported that in *Allium bidwelliae* (2n=14), and the tetraploid, *A. macranthum* (2n=—, 28), the complement shows a distinct size differentiation of the chromosomes into three groups.

CHANGE IN CHROMOSOME NUMBER

After a brief reference to recent progress in the determination of chromosome numbers in *Allium*, reports on change in chromosome number in *Allium* will be briefly considered. Such change in chromosome number is towards (a) euploidy, consisting of the duplication or loss of entire chromosome sets; and (b) aneuploidy, consisting of an increase or decrease by less than an entire chromosome set.

PROGRESS IN DETERMINING CHROMOSOME NUMBERS. Feinbrun (1965) reported that chromosome numbers had been determined for 16 *Allium* species with the x=7; 96 species with the x=8, and 4 species with the x=9, basic numbers. Since that date Aase (1965), and some previous reports, has provided determinations for almost all of the North American *Allium* species. The percentage of Eurasian species for which chromosome numbers have been determined is at least 30 per cent. The progress since 1954 is shown in Table 7, where the percentages of chromosome numbers determined in species with the basic x=7 and x=8, are indicated.

This shows that about 88 per cent of the 111 species with the basic x=7 chromosome number have been determined. It is to be noted that about 73 per cent of the species with the x=7 basic number are diploids (2x). However, for some of these tetraploid (4x) "races" and higher ploidy "races" have also been reported which do not show up in the table. About 4 and 10 per cent of those determined are tetraploids (4x), and higher ploidy, respectively.

Similarly, about a third (35 per cent) of the 521 species with the x=8 basic chromosome number have been determined. About 27 per cent of these are diploids (2x). Again, for some of these tetraploid

(4x) "races" and higher ploidy "races" also have been reported which do not show up in the Table. The percentage of tetraploids (4x) is slightly higher than for species with the x=7 basic number, but the proportion of those with higher ploidy is lower.

The reports for chromosome numbers of the species with the x=7 basic numbers is nearing completion, but much work is needed with the species having the basic x_2=8 number. As indicated in the Table, the relatively few species reported with the x=9 and x=10 basic numbers are all diploids (2x).

Table 7. Genus **Allium** L. Percentage of chromosome numbers determined for species with the basic x=7, the secondary basic x_2=8 numbers, indicating the percentages of diploids (2x), tetraploids (4x), and higher ploidy ranges. The few species with the tertiary x_3=9, and quadrinary, x_4=10 basic numbers, are all diploids.

Basic chromosome number; and total number of species:		2x	4x	higher ploidy	total per cent
x=7 (total number of species 111)	per cent of species determined	73.8*	4.1	10.8	88.7
x_2=8 (total number of species 521)	per cent of species determined	27.6**	6.5	1.2	35.3

* Includes some reports for tetraploid (4x) and higher ploidy races.
** Includes many reports for tetraploid (4x) and higher ploidy races.

EUPLOIDY IN ALLIUM. Mensinkai (1939) studied 17 Allium species. Six of these are polyploids and all appeared to be allopolyploids which usually are more vigorous in nature than autopolyploids. Mensinkai (1939) points out that in an autopolyploid all the chromosomes of the genome are represented several times over, and thus all of the genes of the species are duplicatd. This results in collective intensification of the characteristics. However, the spontaneous occurrence of structural variations is low, and the chances for new mutants to arise in them are few compared with the allopolyploids. Compared with diploids, autopolyploids when fertile, have greater potentialities for variation by gene mutations. Allopolyploids have the added advantage of having genetically dissimilar chromosomes and the consequent capacity for structural changes as a special mechanism of variation.

ANEUPLOIDY IN ALLIUM. As indicated incidentally earlier in this paper, one of the more significant evolutionary tendencies in Allium is toward establishing a series of supernumerary basic chromosome numbers by means of aneuploidy. This represents a step in the evolution of the genus by insuring incompatibility with neighboring species of differing basic chromosome numbers. This leads to new subgeneric groups in the course of time.

In *Allium*, four such basic numbers have evolved, x=7, x=8, x=9 and x=10. The question arises at once as to which is the primary basic number from which the others have evolved directly or indirectly. The reconstruction of the evolutionary past of the genus *Allium* as far

as possible on the basic of phytogeography in earlier discussions appears to point to x=7 as the primary basic number. This has now to be tested on the basis of caryological researches with *Allium* species beginning with Levan (1931), and supporting evidence from chemistry, phenontalogy (morphology), and anatomy.

On the basis of chromosome morphologic considerations, Levan (1935) came to the conclusion that "The karyologically . . . most primitive species of *Allium*, those with 14 chromosomes, have almost exclusively medianly (m) inserted chromosomes. The cytologically most derivative forms, those with 16 chromosomes, have proportionally more chromosomes with terminal (t) insertion." In the same paper, Levan (1935) reported on three species with x=18 chromosome number, and in an earlier paper, Levan (1932) on two 18 chromosome species with "two t or st chromosomes per genome and thus may be easily derived from the 16 chromosome species (of *Allium*, and *Nothoscordum*) by segmentation of one m chromosome per genome. Such segmentations are actually still occurring in the (related) *Nothoscordum*" (Levan & Emsweller, 1938). It is to be noted that the reasoning is based on mechanisms that are still occurring in *Allium* and the related *Nothoscordum*.

Eid (1963) studied the chromosome morphology of *Allium neapolitanum* (x=7), *A. roseum* (x=8) and *A. zebdanense* (x=9), all Mediterranean species which have been placed in Section Molium in the past. In *A. neapolitanum* the chromosomes are metacentric, but in the latter two species teleocentries are also present. Eid concluded that in this case the basic numbers form an ascending series since the teleocentries have been derived through misdivision of the metacentric chromosomes of the basic x=7.

Results reported by Saghir (Ph.D. thesis, 1964) indicate that "the majority of the species of the section Molium have the basic x=7 chromosome number and contain a relatively high proportion of methyl sulfide and a low proportion of allyl sulfide, but in *A. roseum* (x=8) and *A. zebdanense* (x=9) the proportion of the methyl radical in the vapor of these two species is smaller and the proportion of the allyl radical is larger than in the species with the basic x=7 number, which indicates a similarity between them and suggests the possibility of their being derived.

In the same work (Saghir, 1964), the leaf anatomy of *A. roseum* (x=8) and *A. zebdanense* (x=9) is typical of that of the species with the basic x=7 chromosome number—one row of vascular bundles and the laticifers located subepidermally. This again suggests that x=8 and x=9 are derived from x=7. In section *Melanocrommyum*, all of the species have the x=8, except one, *A. karatavicnse*, which has the basic x=9 chromosome number. The leaf anatomy of this species is typical of that of the x=8 species—there are two rows of vascular bundles and the laticifers are embedded in the mesophyll. This again suggests that x=9 may be derived from x=8.

On the basis of these results from chemistry and anatomy, Saghir concluded that they lend support to the work of Levan (1932, 1935),

Levan & Emsweller (1939), (also Eid, 1965) to the effect that the primitive basic chromosome number in *Allium* is x=7, and that x=8 and x=9 are derived from the first either directly or indirectly.

In contrast to the results just summarized, Mensinkai (1940) and Brat (1965) have reached opposing views.

Mensinkai (1940) states that "8 appears to be the most primitive number since 90 per cent of the species in the list (as of 1939, which he appends) have 8 or its multiple as their haploid number." As indicated earlier, in the light of phytogeography, there is no warrant in believing that this is so merely because 90 per cent of the species in the list he made have the basic x=8 chromosome number. All of Mensinkai's caryological explanations for the derivation of x=7 and x=9 from x=8 are highly speculative and are not based on observable tendencies within the genus *Allium* and the related *Nothoscordum*, and Mensinkai's explanation cannot displace Levan's and Eid's evidence from caryology, and which is based upon observable mechanisms within the genus *Allium*.

Brat (1965) suggests that in considering the basic chromosome numbers in *Allium* it is important to work within groups which inhabit particular centers of distribution. In the section *Codonoprason* most of the species have the basic x=8 chromosome number, and only two species, *A. fuscum* (x=7) and *A. pseudoflavum* (x=9), are atypical in the group. He suggests that the single x=7 and x=9 species were derived from the x=8 species which are the norm (larger in number) in the group. He has apparently overlooked the role of phytogeography as already detailed, and in so doing has assumed with Mensinkai (1940) that since most of the species in *Codonoprason* have the x=8 number, it follows that the few exceptions have been derived from x=8 simply because there are more x=8 species. He derived x=9 from x=8 again, for the same wrong reason.

The evidence from phytogeography as presented earlier in the present paper is apparently in harmony with the evidence presented by Levan (1932, 1935), Levan & Emsweller (1938), and Eid (1965) on a caryological basis, and the results reported by Saghir (1964) on the basis of chemistry, and anatomy. Thus we are justified in accepting x=7 as the primary basic number in *Allium* since the preponderance of evidence supports it.

MAKING A GROUPING CHOICE

Although *Allium* species with the basic x=7 and x_2=8 basic chromosome numbers may be growing side by side, they are each evolving in separate directions as shown for *Allium neapolitanum* (x=7), of the Section *Molium*, and *A. roseum* (x_2=8) which also has been placed in the same Section, to mention only one instance. They have different proportions of methyl and allyl volatiles (Saghir, 1965). With the passing of time, other differences have most likely appeared, and others will show up in the future due to further evolution.

Once a series of basic chromosome numbers has evolved in a genus, each member of the series tends to be effectively isolated from the others. This usually rules out reticulate hybridization between species in the separate groups under ordinary conditions. Such isolated groups may provide a natural basis for the recognition of subgenera within the genus. In such a genus as *Allium* L. with over 650 species, it is a practical necessity to subdivide it to the extent warranted by the facts in order that it may be understood.

In *Allium*, with the *primary basic* x=7 chromosome number, the *secondary*, x_2=8 basic number apparently has been derived at various times from the primary basic number before and after the inter-glacial period. Those derived earlier and later apparently may potentially interbreed under ordinary conditions. Thus, they each form a natural group with members that differ phenontologically in some particulars. The x_2=8 species have no future on a genetic basis with any species with the x=7 basic number, and the group can be considered as a natural one so long as potential reticulate hybridization is inherent within it. The same observations may be made for the derived groups with the tertiary, x_3=9, and *quadrinary*, x_4=10, basic numbers.

The genus *Allium* may be grouped into at least three natural subgenera (see Traub, 1968b) due to a significant relationship between the basic chromosome numbers and the number and orientation of vascular bundles in the leaf blade; (to which may be added the number of nerves in the floral tepals), as indicated in Table 8.

Table 8. Genus **Allium** L.: grouping into subgenera using the basic (x) chromosome numbers, the number and orientation of leaf vascular bundles, and the number of nerves in the floral tepals, as criteria.

Subgenus	basic chromosome numbers (x) of species	foliage leaf blade; vasc. bundles; number of rows; orientation	floral tepals; number of nerves
I. **AMERALLIUM**	x=7, except a few x_2=8 and x_3=9	in one row with few exceptions	1-nerved
II. **NECTAROSCORDUM** ..	x_2=8	in one row	3—7-nerved
III. **ALLIUM**	x=8, except a few (x=7?) x_3=9 and x_4=10	(a) in flat or furrowed leaves, 2 opposed rows; (b) in fistulose * leaves, 1 circular row; or 1 irregular circular row (or 2?)	1-nerved

* No species with terete (solid) leaves have been studied so far.

An explanation apparently is in order with reference to the few exceptions noted in two of the subgenera. The evolutionary path is *asymmetrical* and never repeats itself; and it is natural that exceptions should be noted. In subgenus I. *Amerallium*, for instance, the few x_2=8 and x_3=9 species can be retained for practical reasons with the usual x=7 species. They are still similar to the latter in various phenontological characters since not sufficient time has elapsed for marked changes. The same can be said for similar exceptions in subgenus

III. *Allium*. Those who are not satisfied with the present grouping may wish to place the species into four subgenera according to the basic chromosome numbers, x=7, x_2=8, x_3=9 and x_4=10. Such a grouping may have some practical advantages for it would stimulate work on the determination of chromosome numbers in order to know where each species belongs. However, for the present, it appears best to proceed as outlined (see Table 8). The number of exceptions encountered is relatively small, and they can be dealt with as deviations that show evolutionary trends within the subgenera, apart from those exhibited by the usual potentially and actually interbreeding members of the population.

KEY TO THE SUBGENERA, SECTIONS AND SUBSECTIONS OF **ALLIUM** L.

In the following tentative key, the subgenera under *Allium* L. are arranged in conformity with the grouping choice indicated in the previous discussion. The subgenera are based primarily on the basic (x) chromosome numbers, recognizing a few exceptions in each case. Within the subgenera, the grouping is on the phenontological [1] basis.

The subgenera are according to Traub (1968b) as explained earlier in this paper. Sections I—IV, including the North American *Allium* species with the basic x=7 chromosome number, are according to Traub (1967, and 1968a); the subsections are based mainly on the Alliances of Ownbey (1966).

Sections V—XVIII, including Old World species, with a few North American representatives are (a) based in the first instance on those of Stearn (1946); (b) with some changes and/or additions according to L. K. Mann in 1957, and as modified by him, assisted by Miss Dora G. Hunt, up to 1963; and (c) with further changes, additions and the inclusion of the reported chromosome numbers of the nomenifer species up to 1965; and the rearrangement of the whole on a tentative evolutionary sequence according to Traub.

1a. Species with the basic x=7 chromosome number, with a few having the x_2=8 and x_3=9 basic numbers; about 75% North American, the rest Old World species.

SUBGENUS I. **AMERALLIUM** TRAUB, **SUBG. NOV.**

Subgenus Amerallium Traub, subgenus nov., (Amaryllidac.)

Species numero basali chromosomorum x=7 possidentes; species pauces numero basali x_2=8 et x_3=9 possidentes; numero basali chromosomorum cum dispositione in linea singula fasciculorum vasculorum folii conjuncto. Typus: Allium canadense L. 2n=14, 28

2a. North American species with the basic x=7 chromosome number:

3a. Plants reproducing by means of seeds, or bulblets in the umbel, or by bulb offsets; rarely by seeds alone; when new bulbs are borne terminally on rhizomes, the old bulbs persist, excepting in A. bolanderi and A. unifolium under Sect. III, subsect. VI; (see also Sect. IV, below).

4a. Bulbs appearing in tufts, produced on stout Iris-like rhizomes, except sometimes smaller in young plants; bulb coats membranous striate with elongate cells in regular vertical rows, and persistent parallel fibers; leaves several, flat, blunt, shorter than the scape: ovaries crestless, except in A. crotophyllum; flowers pink: Section I. CAULORHIZIDEUM Traub, in Plant Life 23: 69. 1967;

[1] The term, **phenontological,** is used in preference to the usual term, **morphological,** because not only form but also all other heritable characters are included (see Traub, 1964), such as anatomy, chemical composition, method of vegetative propagation (physiology), color, odor, taste, etc.

syn.-Allium Validum Alliance, Ownbey (1966). Nomenifer: **Allium validum** S. Wats. **2n=—, 28, 56**

4b. Rhizomes often absent, or if present, then elongated, or reduced in size:

5a. Ovary crested or not crested; bulb coats membranous, or with a persistent reticulum of fibers:

Section II. **AMERALLIUM** (Plant Life 23: 89-95. 1967; nomenifer: **Allium canadense** L. **2n=14, 28**).

6a. Bulb coats thin, papery ,with indistinct vertical fibers; ovary crestless or crested:

Subsection I. **MEXICANA** Traub, Plant Life 23: 89-95. 1967, **anglise (Mexicanae)**; ibid. 24: 135. 1968. Nomenifer: **Allium mexicanum** Traub, **2n=?**.

6b. Bulb coats with a persistent reticulum of fibers; ovary crestless or crested:

Subsection II. **CANADENSIA** Ownbey ex Traub, in Plant Life 23: 89, 95. 1967, **(Canadenase)**; syn.-Allium Canadense Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium canadense** L. **2n=14, 28.**

5b. Ovary crests present (except in **A. lacunosum** and **A. hyalinum**), bulb coats membranous; secondary development of the inner epidermal cells of the inner bulb coats; or not characterized by such development:

Section III. **LOPHIOPRASON** Traub, in Plant Life 23: 69. 1967 Nomenifer: **Allium sanbornii** Wood; **2n=14.**

7a. Plants reproducing by seeds or offsets, or by bulbs on terminal rhizomes, the old bulbs persisting:

8a. Species not marked by the secondary development of the inner epidermal cells of the inner bulb coats:

9a. Leaves 2 or more, rarely 1, per scape:

10a. Leaves 2 (or 1) per scape, often flat or falcate; crests usually poorly developed; scape usually flattened. often strongly so; with "tumble weed" type of seed dispersal; mostly xerophytic:

Subsection I. **FALCIFOLIA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Falcifolium Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium falcifolium** Hook. & Arnott; **2n=14.**

10b. Leaves more than 2 (several) per scape; ovary crested; bulbs mostly elongate; scape decurved near apex:

Subsection II. **CERNUA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Cernuum Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium cernuum** Roth & Roem. **2n=14.**

9b. Leaf solitary per scape, except leaves 2 per scape in **A. bieglovii**; ovary prominently crested with members often lacerate; xerophytic:

Subsection III. **SANBORNIANA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Sanbornii Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium sanbornii** Wood; **2n=14.**

8b. Species usually marked by the secondary development of the inner epidermal cells of the inner bulb coats:

11a. Leaves 2—4, rarely 1, per scape, ovary usually inconspicuously crested (except crests replaced by an obtuse, thickened ridge in **A. lacunosum**, or crests absent in **A. hyalinum**); the inner epidermis of the inner bulb coats usually becoming thickened, forming a moisture-retaining membrane with cellular markings characteristic of the

species; xerophytic:

Subsection IV. **ACUMINATA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Acuminatum Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium acuminatum** Hook. **2n=14.**

11b. Leaves 2 per scape; ovary conspicuously crested; bulbs small, spherical; with usually sinuous walls (cleft or recessed) on the inner epidermal cells of the inner bulb coats; mesophytic:

Subsection V. **CAMPANULATA** Ownbey ex Traub, in Plant Life 23: 69. 1967; syn.-Allium Campanulatum Alliance, Ownbey (1966), **anglise.** Nomenifer: **Allium campanulatum** S. Wats. **2n=14.**

7b. Bulbs arising, or sometimes arising, terminally on a stout lateral rhizome, the old bulbs not persisting in the process (see also Sect. **Rhophetoprason,** below):

Subsection VI. **BOLANDERIANA** Traub, **subsect. nov.**

Subsection **Bolanderiana** Traub, **subsect. nov.,** Sect. **Lophioprason,** genus **Allium** L.

Tunicae bulborum reticulatae, reticulis obscuris angustis horizontalibus vel transverse serratis; bulbis semper vel interdum rhizomas laterales terminantibus, bulbis vetustis non persistentibus. Typus: **Allium bolanderi** S. Wats. **2n=14.**

3b. Plants reproducing by seeds, and by producing flowering-sized bulbs terminally on rhizomes, the old bulbs not persisting; bulb coats membranous, sparsely vertically veined with fibers; leaves 4—5 or more, prominently sheathing below:

Section IV. **RHOPHETOPRASON** Traub, in Plant Life 23: 110. 1967, **anglise;** ibid. 24: 141. 1968. Nomenifer: **Allium glandulosum** Link & Otto; **2n=—, 28.**

2b. Old World species with usually the x=7 basic chromosome number, including a few species with the $x_2=8$ and $x_3=9$ basic chromosome numbers:

12a. Scape not triquetrous:

13a. Floral umbel not nesting in the center of the leaves:

Section V. **MOLIUM** Endl. (1836). Nomenifer: **Allium neapolitanum** L. 2n=14, 28.

Section VI. **XANTHOPRASON** F. Hermann (1939). Nomenifer: **Allium moly** L. 2n=14.

13b. Floral umbel nesting in the center of the leaves, which lie on the ground; minute species; leaves 4 narrow, umbel 4-flowered; flowers white:

Section VII. **CHAMAEPRASON** F. Hermann (1939). Nomenifer: **Allium chamaemoly** L. **2n=?**

12b. Scape triquetrous:

Section VIII. **OPHIOSCORDON** (Wallr.) Endl. (1836). Nomenifer: **Allium ursinum** L. **2n=14.**

14a. Leaves oblong, acuminate at both ends:

Subsection I. **URSINA** (nomenifer: **Allium ursinum** L. **2n=14.**)

14b. Leaves petiolate, blade sharply keeled; stamen-filaments very narrow, inserted in two series; seeds arillated.

Subsection II. **TRIQUITRA** (nomenifer: **Allium triquetrum** L. **2n=18;** note also **Allium pendulinum** Ten. **2n=14, 18; A. paradoxum** (M.B.) G. Don; **2n=16**)

1b. Species with the basic $x_2=8$ chromosome number, with a few exceptions having $x_3=9$, and $x_4=10$ basic numbers; all Old World species, except one North American species, and a few North American subgroups of Old World species:

15a. Tepals 3—7-nerved; seeds 8—11 per locule; pedicels markedly discoidally swollen at the apex:
SUBGENUS II. **NECTAROSCORDUM** (Lindl.) Traub. **comb. nov.**, Syn.-genus **Nectaroscordum** Lindl., Bot. Reg. 9: pl. 1912. 1836. Nomenifer: **Allium siculum** Ucria, 2n = 16.
Section IX. **NECTAROSCORDUM**

15b. Tepals 1-nerved; pedicels, if at all, only slightly swollen at the apex:
SUBGENUS III. **ALLIUM** (nomenifer: **Allium sativum** L., 2n = 16, 48)

16a. Leaves not fistulose:

17a. Leaves oval to petiolate:
Section X. **ANGUINUM** G. Don ex Koch (1837); Nomenifer: **Allium victorialis** L. **2n = 16, 32**

17b. Leaves not oval to petiolate:

18a. Umbel more than 2-flowered:
Section XI. **RHIZIRIDEUM** G. Don ex Koch (1837); nomenifer: **Allium senescens** L. **2n = —, 32, 48.**
Subsection I. **TUBEROSA** (nomenifer: **Allium tuberosum** Rott. ex Spreng. **2n = 16, 32.**)
Subsection II. **INDERIENSIA** (nomenifer: **A. inderiense** Fisch. ex Bunge, **2n = ?**)
Subsection III. **SENESCENSIA** (nomenifer: **A. senescens** L. **2n = —, 32, 48.**)
Subsection IV. **SIKKIMENSIA** (nomenifer: **A. sikkimense** Bak. **2n = —, 32.**)
Section XII. **MELANOCROMMYUM** Webb & Berth. (1843); nomenifer: **A. nigrum** L. **2n = 16.**
Section XIII. **CODONOPRASON** (Rchb.) Endl. (1836); nomenifer: **A. oleraceum** L. **2n = —, 32, 40.**
Section XIV. **PETROPRASON** F. Hermann (1939), nomenifer: **A. obliquum** L. **2n = 16.**
Section XV. **ALLIUM** (nomenifer: **A. sativum** L. 2n = 16.)
Section XVI. **HAEMOPRASON** F. Hermann (1939); nomenifer: **A. melanantherum** Panc. **2n = ?**)

18b. Umbel 1-, rarely 2-flowered; plant small, delicate, slight alliaceous odor; leaves 1—2, nesting on the ground; style 3-lobed nearly to the middle:
Section XVII. **MICROSCORDUM** Maxim. (1887); nomenifer: **A. monanthum** maxim. **2n = 16, 32.**

16b. Leaves fistulose:
Section XVIII. **CEPA** (Moench) Prokh. (1931); nomenifer: **A. cepa** L. **2n = 16, 32.**
Subsection I. **CEPA**; nomenifer: **A. cepa** L. **2n = 16, 32.**
Subsection II. **FISTULOSA**; Nomenifer: **A. fistulosum** L. **2n = 16.**
Subsection III. **SCHOENOPRASA** (nomenifer: **A. schoenoprasum** L. **2n = 16, 32.**)
Subsection IV. **POPOVIANA** (nomenifer: **A. popovii** Vved. **2n = 16.**)

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THE INHERITANCE OF MELON FLOWER COLOR IN **HEMEROCALLIS WASHINGTONIA**

Hamilton P. Traub, G. W. Bohn and Thomas W. Whitaker

There is a paucity of information concerning the inheritance of flower color in *Hemerocallis*. The following note records some observations of flower color in the allotetraploid *H. washingtonia* (Traub, 1951, 1959, 1960) which we hope will be helpful to breeders investigating these problems. The gene or genes responsible for melon flower color (color similar to the flesh of a cantaloupe) are widely distributed in hybrid diploid *Hemerocallis* species (2n=22). For example, it occurs in the clones 'Frances Fay', 'Satin Glass', and others. It also occurs in the allotetraploid *H. washingtonia* (2n=44) derived from similar diploids. Melon flower color in its yellow or pastel form appears in progenies of both diploids and the tetraploid, but no studies have been made of its inheritance.

During 1964 a tetraploid "melon" seedling was pollinated by a tetraploid "mulberry purple" seedling. The seeds were planted in December 1964, and the seedlings transplanted to the field in February, 1965. A few of the seedlings flowered in August, 1965, and the remainder in the spring and summer of 1966. The results are shown in Table 1.

Table 1. Progeny from the cross melon x mulberry purple in **Hemerocallis washingtonia.**

Flower Color		Observed	Expected	Chi-square
Melon				
yellowish melon		6		
pastel melon		3		
	Total	9	7.25	0.4224
Purple				
deep purple		6		
red purple		101		
	Total	107	108.75	0.0281
Totals		116	116.00	0.4505

If the two shades of melon flower color and the two shades of purple are combined, the calculations show a non-significant chi-square, assuming two factor segregation in the tetraploid *H. washingtonia*. It is also

assumed that only the full recessive exhibits the melon phenotype. This interpretation is merely tentative. Selfing and backcrossing of selected melon and purple phenotypes would be required to establish the hypothesis. Unfortunately most siblings are self-sterile and cross sterile. With non-siblings, however, fertile matings occur so that the project could be carried forward by propagating these combinations. It is hoped these few observations will stimulate others engaged in breeding *Hemerocallis* particularly *H. washingtonia*, to report their results.

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PLANT LIFE LIBRARY

INTRODUCTION TO PLANT BREEDING, by Fred N. Briggs and P. F. Knowles. Reinhold Publishing Corporation, New York. 1967. 426 pp. $12.50. It seems trite to state that the test and later success of any textbook can be measured by its capability to fill the niche for which it was designed. This textbook by the late Dean F. N. Briggs and Prof. P. F. Knowles, both of the Davis Campus of the University of California, has been specifically tailored to satisfy the needs of advanced undergraduates for a course in plant breeding. In the opinion of the reviewer, *Introduction to Plant Breeding*, is admirably designed to meet this challenge.

A glance at the title and sub-titles of the 30 chapters of the book suggests, furthermore, that the prospective student before attempting to use this book should be well grounded in the biological sciences, particularly genetics, botany, and perhaps some phase of crop production. If we assume a student has these requirements, Chapter 4 (Mode of Reproduction in Relation to Plant Breeding Methods) could be eliminated, since much of this material is covered in elementary courses in Botany and perhaps elsewhere. The same might also be said of Chapters 5 and 30, which are concerned with statistics, but here Prof. Knowles makes a compelling case for including some statistics in an undergraduate text on plant breeding.

A pleasant and instructive innovation are the quotations that follow each chapter heading. These quotations from such varied authorities as Darwin, Walt Whitman, F. R. Sears, and Paul Mangelsdorf set the theme for the ensuing chapter. The Résumé of each chapter, followed by an abundant list of pertinent references are helpful pedagogical aids. It is disappointing to note that the authors have not included a set of questions for discussion or problems for solution at the end of each chapter. Discussion and problems are proven techniques for assisting the motivated student to acquire an understanding of a subject. Surely, they would have improved a textbook of Plant Breeding.

Coverage of the principles and methods of plant breeding is current and comprehensive. There is an Appendix of three statistical tables, and a sixteen page Index.—*Thomas W. Whitaker.*

ORIGINS OF MENDELISM, by Robert C. Olby. Schocken Books, New York. 1966. 204 pp. $6.95. This scholarly, well-written book by Dr. Robert C. Olby, Librarian, Botany School, Oxford University, Oxford, England, dissipates under a load of evidence the widespread myth that Gregor Mendel, the gentle Austrian monk and founder of genetics, worked in a vacuum, and owed nothing to his

predecessors or contemporaries. Olby's researches clearly show that the success of Mendel's work was not an isolated phenomena, but the culmination of a series of studies commencing with the classical hybridization experiments of Koelreuter about a century before Mendel's paper was published. This is not to denigrate Mendel or his achievements. Mendel, although a shy and humble man, probably had one of the most brilliant and creative minds in the entire history of Biology, and he used it well.

Olby's carefully documented research reveals that Mendel's approach to biology was primarily that of a physicist. This is not surprising since much of his training at the University of Vienna was in experimental physics, the use of physical apparatus, and the mathematical analysis of physical problems. Furthermore, for a number of years he was an instructor in physics and natural philosophy at the technical high school in Brno. Olby suggests that Mendel looked upon his famous hybridization experiments with peas much as he would a classroom demonstration in physics. As Olby shows, this explains in part Sir Ronald A. Fisher's criticism of Mendel's results.

This book is important because it analyzes in detail what might be called the life and times of Mendel; the reasons why his work was ignored for a period of over 30 years, and finally the setting in which the work was rediscovered. Although Olby does not mention it, his meticulous research strongly suggests that there were really only two rediscoverers of Mendel's work, de Vries and Correns. It is clear that de Vries and Correns independently performed experiments that supported Mendel's results when they came upon his paper, "Experiments on Plant Hybrids," published in 1866. Furthermore, de Vries and Correns developed an interpretation to explain their data. On the other hand, there is no evidence that Tschermak (the third codiscoverer) had a real understanding of the Mendelian rules of heredity.

Professor C. D. Darlington has written a provocative Foreword. It is characteristic undiluted Darlingtoniana, fresh, suggestive, perhaps not always correct in detail, but invariably stimulating. Even Prof. Darlington's sharpest critics have never accused him of being dull. There is an Index, and an Appendix to each Chapter collected in the rear of the book. To avoid extensive documentation in the text, pertinent quotations from such well known biologists as Koelreuter, Buffon, Amici, Galton, Fisher and others, are assembled in the Appendices.

The Origins of Mendelism makes pleasant reading, and if one is curious about the development of great ideas in science and their subsequent reception, this book supplies a detailed documentary of the entire process. With this book along with the excellent, "Origin of Genetics—A Mendel Source Book," by Stern and Sherwood, we have a complete record, or as complete as it is ever likely to be, of all aspects of the Mendelian story.—*Thomas W. Whitaker*

GENETIK UND ZYTOLOGIE VON ANTIRRHINUM L. SECT. ANTIRRHINUM, by Hans Stubbe. Veb Gustav Fischer Verlag, Jena. 1966. 421 pp. 82 dr. For those fortunate individuals fluent in German, and interested in genetics and cytology, reading this book of 421 pages by Prof. Hans Stubbe could be a rewarding experience. Packed with information, not only about the genetics and cytology of *Antirrhinum*, but also the systematics, distribution, morphology, and ecology of the genus, it is a fitting monument to Prof. Stubbe's consistent record of high level research. Truly a *magnum opus*, Prof. Stubbe has dedicated the book to his teachers, Erwin Bauer and Fritz von Wettstein, those giants of German biology of the early part of this century. Bauer commenced investigations with *Antirrhinum* about 1906; the latest paper cited by Stubbe was published in 1963; thus the book covers nearly 60 years of experimental work with snapdragons. Lest anyone think Stubbe was not an active participant in these investigations, an inspection of the list of literature cited shows that he is the author of more than 30 papers specifically concerned with *Antirrhinum* genetics. The book is indeed a classic example of the thoroughness and best in German scholarship.—*Thomas W. Whitaker*

INVESTIGATIONS INTO GENERATION 1651-1828, by Elizabeth B. Gasking. The Johns Hopkins Press, Baltimore. 1967. 192 pp. $6.00. This scholarly, meticulous history of sexual generation from 1651 when William Harvey published his *De Generatione* up to 1828 when von Baer discovered the mammalian egg is authored by an Australian, Dr. Elizabeth Gasking of the Department of History and Philosophy of Science, University of Melbourne, Melbourne. Dr. Gasking has done her homework well. The book is copiously documented; there is a Bibliography of 101 references, and adequate Index, and a Time Chart of the history of generation from 1651 to 1915.

The word "Generation" in the title may puzzle the layman, and even the modern biologist. Dr. Gasking explains that "Generation" in its restricted sense was the term applied to the coming into existence of new individual organisms both animal and plant, regardless of the method involved. Gradually the meaning of the term was broadened to include the problems of organic growth and differentiation. After being used from antiquity until the beginning of the nineteenth century the word "Generation", through some accident of history, fell into disfavor and gradually into disuse, although there continued to be no lack of interest in the problems it formerly designated. In fact, these problems have achieved some semblance of unity in modern genetics.

Dr. Gasking is concerned primarily with the theoretical opinions advanced by influential biologists, and the investigations which moulded their opinions, and determined their outlook. The distinguished array of early experimental biologists whose work is extensively analyzed, includes in addition to William Harvey; Maupertuis, Wolff, Haller, Bonnet, Spallanzani, von Baer and several others. Present day biologists curious about what their precursors were doing and thinking during the late seventeenth and eighteenth centuries can turn to Gasking's book for an authoritative answer.

Despite the fact that the period covered was one of the most exciting in the entire history of biology, I found the book difficult to read, and occasionally downright dull. Dr. Gasking's writing is on the whole pedestrian and lacks the sparkle and zest needed to hold her readers, even though her scholarship may be impeccable —*Thomas W. Whitaker*

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For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

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GENERAL AMARYLLID EDITION

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CORRIGENDA

PLANT LIFE, Vol. 23, 1967

Page 61, 18th line, change "E. L. Brasol, near Daytona Beach, Florida" to "a collector in eastern peninsular Florida".

Page 67, center of page, *Narcissus tazetta* subsp. *chinensis* var. *"plenifloras"*, 4th line, change "11-16-50" to "1-16-50 a+b+c".

SUPPLEMENT—REVIEW OF THE GENUS NERINE (see also corrigenda PLANT LIFE Vol. 24. 1968 p. vi.)

Page 3, 12th line from bottom of text, change "Winsome F. Baker" to "Winsome F. Barker".

Page 10, change "7. *rydleyi*" to "7. *ridleyi*".

Page 16, 12th line from bottom, change "1805" to "1905".

Page 19, 3rd line from top, change "*rydleyi*" to "*ridleyi*".
11th line from bottom, change "rose pink" to "mauve pink".

Page 21, under "11. *Nerine alta* (err. *alata*).
8th line from bottom, change "(Hogsbeck)" to "(Hogsback)".
14 to 15th line from bottom, change "Hogsbeck" to "Hogsback".

Page 23, 13th line from top, change "Prof. T. Baron" to "Prof. T. T. Barnard".

Page 24, under 16. *Nerine brachystemon*, 1st line, change "Bulb unknown" to "Bulb ovoid, rather small."

PLANT LIFE, Vol. 24, 1968

Page 50, Fig. 14, 2nd and 3rd lines, change "Sultinate" to "Sultanate".

Page 127, 14th line from bottom, change "(1841)" to "(1823-31)".

Page 130, 18th line from top, change "holonomenifer" to "leetonomenifer".

Page 134, in the key, under 19a, 3rd line, change "14. *michoacanense*" to "14. *michoacanum*".

Page 136, under 2. *Allium scaposum*, 10th line, change "tepals 6 cm. long" to "tepals 6 mm. long."

Page 139, under 11. *Allium ownbeyi*; Range.—, change "about 30 mi. north of Monterrey" to "within western edge of City of Monterrey." See also Plant Life 25:56. 1969. Under 13. *Allium elmendorfii*, 2nd line, change "Allium elmandorfii" to "Allium elmendorfii".

Page 141, under 19. *Allium glandulosum*, 2nd line, change "1841" to "1828-31".

Page 154, 19th line from bottom, change "Feinbrun (1965)" to "Feinbrun (1954)".

Page 159, from bottom of text, 2nd line up, change "*erotophyllum*" to "*eurotophilum*".

Page 162, 6th line from bottom, change "Feinbrun, N. Palest, J. Bot. Jerusalem 5:13. 1950" to "Feinbrun, N. Caryologia, Vol. suppl. 1954, pp. 1036-1041."

LINEAGICS, BY HAMILTON P. TRAUB

Published Aug. 6, 1964

CORRIGENDA

(See also Corrigenda PLANT LIFE Vol. 21, 1965, pp. vi.—vii.)

Page 18, 12th line from top, for "Mauterpuis" read "Maupertuis".
16th line from top, for "Mauterpuis" read "Maupertuis".

Page 26, 12th line from top, change "cretaceans" to "cetaceans".

Page 35, 23rd line from bottom, change "Mauterpuis" to "Maupertuis".

Page 36, 3rd line from bottom, change "Mauterpuis" to "Maupertuis".
7th line from bottom, change "Mauterpuis" to "Maupertuis".

Page 37, 10th line from top, change "Mauterpuis" to "Maupertuis".
7th line from bottom, change "Mauterpuis" to "Maupertuis".

Page 36, 1st paragraph, 1st line, change "Mauterpuis" to "Maupertuis".
2nd paragraph, 6th line, change "Mauterpuis" to "Maupertuis".

Page 48, 18th line from top, change "Wilheim" to "Wilhelm".

Page 58, 1st line, change, "Mauterpuis" to "Maupertuis".

Page 62, Fig. 2, 4th line, change "mathematices" to "mathematics".

Page 64, 13th line, change "basic" to "basis".
17th line from top, change "fall" into "falls".

Page 97, 4th line from bottom, insert "to" after "closely".

Page 107, 1st paragraph, 7th line, change "are" to "is".

Page 112, 1st line, change "Methanabacae" to "Methanobacae".

Page 141, Table 27, 1st line, change "Superphylum" to "Superkingdom".

Page 145, 10th line from top, change "EUMACOTAE" to "EUMYCOTAE".

Page 155, 26th line from top, place "Lectures, 1961-62" at the end of the line beginning "Lees, H. etc."

Page 162, 20th line from top, change "Mauterpuis" to "Maupertuis"

PLANT LIFE, VOL. 25, NO. 1, January, 1969

AMARYLLIS
YEAR BOOK
1969

Year Book of
The American Amaryllis Society
86th Issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California 92037

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For the roster of the general officers of the Society. the reader is referred to the inside front cover of this volume.

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 168.]

PREFACE

The cover design by Prof. Penrith B. Goff, of Wayne State University, Detroit, Michigan, represents *Amaryllis aulica stenopetala* as grown and photographed by Sam Caldwell in Tennessee from bulbs imported by Robert D. Goedert from South America. Prof. Goff is to be congratulated again on another beautiful cover design.

This 36th issue of the AMARYLLIS YEAR BOOK is dedicated to William Quinn Buck who received the WILLIAM HERBERT MEDAL for 1969 in recognition of his outstanding contributions toward the advancement of the amaryllids, particularly pioneer work with tetraploid daylilies (*Hemerocallis washingtonia*), and work with various other amaryllids. Mr. Buck contributes an autobiography and a report on *Hemerocallis* to the present issue.

Dr. Martin Cardenas, the recipient of the 1967 WILLIAM HERBERT MEDAL, has named a new Bolivian *Amaryllis* species, *A. escobaruriae* in honor of the La Paz Burgomaster, General Armando Escobar Uria, who staged the first flower show in La Paz in 1968. The members of the Society congratulate General Escobar Uria and Bolivia on its first flower show.

In the present edition, papers on exploration for amaryllids in South America are contributed by Dr. Ruppel and J. L. Doran.

Articles on *Amaryllis* are contributed by Fred J. Buchmann, Russell H. Manning, V. Roger Fesmire, Joseph K. Mertzweiller, J. T. Schmidt, Mr. and Mrs. Alek Korsakoff and Mrs. Fred Tebben.

Prof. Pedro F. Ravenna reports on new species of *Phaedranassa, Griffinia, Amaryllis* and *Nothoscordum*, including some excellent illustrations.

Dr. Easterly reports on the chromosome number in *Lycoris* "cinnabarina", and hardiness of some *Lycoris* species in Ohio, and Miss Grapes writes about the hardiness of some *Lycoris* species in western Nebraska.

Dr. John M. Cage reports on his *Sprekelia-Habranthus* hybrid, and also on the uses of some systemic pesticides with amaryllids. Mr. Hudson writes about the blooming of the Blue Amaryllis in South Carolina, and Miss Grier reports on the culture of *Narcissus* in southern California.

Mr. Tisch writes about his experiences with amaryllids in California, and on the naturalizing of plants. Prof. Davis details the handling of *Brunsvigia* x *parkeri* in Louisiana. L. S. Hannibal writes about various crinums and *Crinum* hybrids.

We are again indebted to Mr. Goedert for his annual report on the Amaryllis Season.

Mr. Van Woesik writes about his trip through the United States, and on the planting, fertilizing and caring for *Amaryllis* grown outdoors.

Dr. Artyushenko contributes a fine grouping of the *Galanthus* species, and Profs. van der Merwe and Grobler report on an electric drying press for herbarium specimens.

Mr. Russell H. Manning writes about sending live amaryllid flowers by mail.

Our good friend, Alek Korsakoff, the amaryllid enthusiast, contributes a most interesting autobiography that all members will enjoy reading.

There are also reports on the annual Amaryllis shows, and various other items as shown in the table of contents.

Contributors to the 1970 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1969, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated. Those having color slides or transparencies which they wish to use as the basis of illustrations, are requested to have black-and-white prints made, and to submit these with their articles.

December 15, 1968
5804 Camino de la Costa,
La Jolla, California 92037

Hamilton P. Traub
Harold N. Moldenke

PLANT LIFE LIBRARY—continued from page 167.

DICTIONARY OF ECONOMIC PLANTS, by J. C. Th. Uphof. 2nd Edition. Verlag von Cramer. Sold in the U.S.A. by Stechert-Hafner, 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 591. This second, revised and enlarged edition of an important reference book on economic plants will be welcomed. In the new edition over 3000 species have been added so that the total number of entries is now 9500. The subject matter, excepting ornamental plants, includes those important in agriculture, forestry, pomology, olericulture, pharmacognosy, and crops producing oils, rubber, spices, essential oils, gums, resins, etc. The entries are arranged alphabetically. The bibliography has been more than doubled. Recommended to all interested in economic plants.

THE MEANING OF EVOLUTION, by George Gaylord Simpson. 2nd Revised Edition. Yale University Press, New Haven, Conn. 1967. Pp. xvii + 368. Illus. cloth, $7.50; paper, $2.45. Subtitled "A Study of the History of Life and of Its Significance for Man", this revised edition of a stimulating book by an outstanding authority, will be welcomed. This easy to read explanation of the evolutionary process is arranged under four sections—prologue, the course of evolution, the interpretation of evolution, and evolution, humanity and ethics. Highly recommended to the specialist, student and the general reader.

READINGS FROM SCIENTIFIC AMERICAN: BIO-ORGANIC CHEMISTRY, with an introduction by Garrett Hardin. W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104. 1968. Pp. 317. Illus. $4.95. The 32 articles by various authorities, published in the Scientific American, have been selected on the basis of "chemical emphasis, significance, novelty and the level of presentation" to close the gap between the classically oriented elementary organic textbook and the detailed biochemical treatise. The three sections of the book are (1) macromolecular architecture, (2) Biological Regulators, and (3) chemical biodynamics. This stimulating text is highly recommended to all interested in recent developments in bio-organic chemistry.

PLANT LIFE LIBRARY—continued on page 54.

Dedicated to
William Quinn Buck

HERBERT MEDALIST—WILLIAM QUINN BUCK

WILLIAM QUINN BUCK

AN AUTOBIOGRAPHY

I was born on April 27, 1908, in Chillicothe, Hardeman County, Texas, where my father published a weekly newspaper. My earliest recollections of plants are of the delightful smell of the peach trees that had come up between the printing office and a big frame building which I think was a livery stable. A little old lady living near the blacksmith shop had a garden so full of plants that no more could have been crowded in, and the garden was almost as fascinating as the blacksmiths' work.

My seventh birthday came while we were visiting my parents' families in Mississippi, and it was there that I got to see the big shrubs from which my grandmother picked the fragrant Cape jasmines that she tried to send by mail each year. The japonica, with its shiny leaves and small red flowers, was so much the center of my interest that severe punishment rewarded my picking the flowers. The green rose was the real marvel of the garden though, and it probably excited my keenest delight.

About the time I was in the third grade we moved to a new home which had a very large garden area, and I immediately began gardening. Learning how to germinate snapdragon seed in spite of the dry West Texas air by shading the seed box with wet sacks, and growing waterlilies for tubs from Burpee seed were among my fondest youthful horticultural accomplishments.

By the time that I went away to Clarendon College in 1925 there was a huge collection of gladiolus corms and dahlia roots that had to be dug, cured, and stored, and of course my mother was the only one to assume the responsibility. Summer gardening thereafter had to be curtailed in many ways.

Study of painting was begun at Clarendon and later continued at Texas Christian University, in Fort Worth, from which I was graduated *summa cum laude* in 1929, with majors in English and art. In the fall of that year I went up to Philadelphia to enter the Pennsylvania Academy of the Fine Arts, oldest art school in the country. In 1930 I was admitted to classes at the Barnes Foundation in Merion, Pa., and I heard the first brief series of horticultural lectures there.

In December of 1929 I got a night job in the proofreading department of The Philadelphia Inquirer. By 1931 classes at the Academy had to be dropped for a year because of a serious illness. About this time myopia became a serious problem. In 1935 I enrolled in the graduate school of the University of Pennsylvania. During these years plant growing had to be limited to a few pots, but seedling

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agapanthuses and a clivia were managed somehow. Frequent visits to Horticultural Hall, the Morris Arboretum, and the University of Pennsylvania botanical garden, and the annual flower shows, gave me plants to see, at least.

In 1937 I suddenly began to have tiny hemorrhages on both retinas, and this hemorrhagic choroiditis and a detached retina in the right eye soon forced me to leave the proof reading job and give up painting permanently. A return to growing plants now became logical. It was during these trying years that I first became interested in the *Hemerocallis* and hybridizing, as well as in using colchicine as a polyploidizing agent. My daylilies had to be grown on a hillside near a spring on the land of a friend in Bucks County, and I lived in the old stone farmhouse at the top of the hill the summer that I had braille lessons.

A couple of trips to Florida and Southern Georgia failed to enable me to become located in a warmer climate, as advised by the oculists. After trying south Texas, also, I arrived in California early in 1942. For a year I worked for Cecil Houdyshel, the bulb grower, in La Verne, and then I went to the University of California at Los Angeles, becoming a senior laboratory technician at the greenhouses in the floriculture department. I was able to do a considerable amount of daylily and amaryllid work here. The polyploidizing experiments were resumed, and in 1948 the first of my induced tetraploid daylily clones flowered. Colchicine was used successfully on germinating orchid seed in this period.

In 1950 I became head of the propagation section at the Los Angeles State and County Arboretum in Arcadia, and during the ensuing fifteen years some of the polyploidizing experiments were squeezed in with the propagation of thousands of plants from all parts of the world. A colchicine-induced tetraploid blue daisy, *Felicia amelloides* 'Santa Anita', obtained from 1951 experiments, later was given an A.M. by the California Horticultural Society and was commercially propagated by the thousands for use in the Los Angeles and San Francisco areas. By treating germinating seed from a fine diploid strain a whole series of wonderful *Gerbera* hybrids was obtained. *Lagerstroemia indica*, the Crepe-Myrtle; *Chorisia speciosa*, *Tabebuia chrysotricha*, *Ligustrum japonicum*, *Fatsia japonica* were among the plants treated in extensive colchicine experiments. A fine collection of amaryllids was brought together here, and some wonderful hybrid amaryllis seedlings were grown, including the *Amaryllis calyptrata* hybrids.

Since my retirement in 1965, the work of polyploidizing and breeding daylilies, amaryllises, and orchids at home has been given all my time. My acre lot has long been filled, and good neighbors are letting me grow seedlings on their ground, and my 18′x60′ greenhouse contains enough plants to fill several. 1968 saw unusually good results with the daylilies, and the improvements in polyploidizing techniques worked out will give even more rapid advancement in coming years, we hope.

1968 HEMEROCALLIS REPORT

W. Quinn Buck, *Chairman, Daylily Committee, American Plant Life Society*

The 1968 season emphasized strongly the importance of having established clumps for breeding daylilies, as well as showing the old problems of regional adaptability. Rather consistently the tetraploid clones from Dr. Traub set seed well on the established clumps and poorly on first-year plants. This year the clones from Dr. Peck bloomed beautifully but again proved poor parents, demonstrating that something still was not to their liking in our soil or climate.

The 1967 introductions from Brother Charles also showed the need for being better established. 'Loyal Subject' was almost an exception to this appraisal, doing best of all of them, and it did so much better in Bakersfield, in number of spikes and in number of pods set, that it raises the strong possibility that low night temperatures here might be to blame. Of the Fay varieties 'Mary Todd' set pods fairly well, and it was a beautiful flower, but it was not sunfast here. 'Golden Surrey' had no fringe on its first flowers, but on the redbloom spike when nights were warmer the fringe was there. Older clumps of Fay tetraploids were good seed parents, with the exception of 'Crestwood Lucy' and 'Crestwood Ann'. Each year 'Crestwood Lucy' will set a few pods here, but 'Crestwood Ann' will set none at all.

'Fair Annet' (Peck) and 'Bonnie Barbara Allen' (Peck) this year were quite beautiful in pink effect in the garden. 'Sir Patrick Spens' (Peck) had the best color of any red tetraploid yet seen, and it seemed almost as sunfast as the old reliable 'Bess Ross' (Claar) in our area. 'Fair Margaret' (Peck) and 'Queen Eleanor' (Peck) were melons of fine form.

Among the newer diploids 'Prairie Moonlight' (Marsh) was particularly outstanding as an established clump, and here it was not rivaled even by the wonderful creamy yellow 'Crystal Sunshine' (Bro. Charles). 'Prairie Melody' (Marsh) again this year was an especially beautiful pink. In the bright lavenders, 'Charlemagne' (Moldovan) had great color appeal, but it may be somewhat lacking in sunfastness in our area. 'Childscraft' (Childs) was most outstanding in both quality and form.

Among the miniature melons 'Little Rainbow', 'Toyland', and 'Cub Scout', all three from Bro. Charles, performed well. 'Little Darling' (Spalding), much branded, and 'Dreamlet' (Childs) were good pink miniatures. 'Little Wart' and 'Wanetta' from Miss Spalding have to stay as favorite lavender-purple miniatures that everybody should grow.

In the Buck garden the results from using treated plants were unusually good, and the clones offering greatest promise included 'Beauty Pageant' (Fay), 'Superfine' (Fay), 'Jewel Case' (Lester), 'Porcelain Dole' (Lester), 'Good Evening' (Wynne), 'Best of Luck' (Wynne), 'Eburnean' (Munson), 'Diamond Anniversary' (Childs), 'Childscraft' (Childs), 'Little Darling' (Spalding), and the beautifully colored

'Raspberry Frills' (Williamson). Many very fine combinations were obtained.

One of the outstanding events of the year was the publication of the *Daylily Handbook* by The American Hemerocallis Society and the American Horticultural Society, as a joint project. This *Handbook* is a most important new working tool for those interested in the *Hemerocallis*.

Fig. 1a. Henry van Woesik, President-Director, Ludwig & Co., in his business office.

TWO MONTHS' AMARYLLIS TRIP IN THE U. S. A.

HENRY VAN WOESIK, *President-Director*
Ludwig & Co., P. O. Box 18, Hillegom, Holland

GROWING AMARYLLIS IN THE OPEN

To study the matter on the spot I decided to visit with all the centers where Amaryllis are grown in the open on a fairly large scale, for which it is obviously too cold in Holland, where these semi-tropical bulbous plants only do well in hothouses equipped with a special heating system, so that even the soil has the ideal temperature.

I started my U. S. Amaryllis trip and lecture tour in Houston, Texas on May 12th 1968, subsequently calling at Corpus Christi, San Antonio, Austin, Beaumont, Baton Rouge, New Orleans, Hattiesburg, Mobile, Chickasaw, Panama City, Tampa, Sarasota, Fort Myers, Miami, Orlando, Jacksonville, Valdosta, Griffin, Greenwood, and Atlanta, after which I went northward, where Amaryllis are grown in much the same way as in Holland. A death in my family prevented me from finding time to see Amaryllis growing in California, Arizona and Oklahoma, which States I intend to visit in 1970.

Of course, I saw no end of Amaryllis grown in yards and gardens, but as some people easily bruise, I may not have been over-anxious to point out the mistakes made.

Let me first mention the positive side of the Amaryllis world in the States I visited:

THE POSITIVE SIDE

(a) The enthusiasm with which Amaryllis-fans grow Amaryllis in the open is overwhelming.

(b) Both men and women have green thumbs, by which I mean that they are ready to work for long hours to get the best results. In my opinion a nurseryman or woman with green thumbs is one that does not balk at working 14 hours a day.

(c) The Amaryllis-groups are found in almost any city and are well organized in Amaryllis Clubs or Garden Clubs and each member is supposed to do his or her share of work to rouse and stimulate interest in Amaryllis.

(d) They organize Amaryllis spring shows, where the most outstanding Amaryllis flowers are a treat to the eyes of the public at large, which cannot but popularize the Queen of Flowers.

(e) Growing methods are conscientiously studied at their monthly meetings, which is bound to improve them in the long run.

(f) At shows there is a fair competition for prizes, though this does not degenerate into prize-hunting, for participating is more important than winning prizes.

(g) They do everything to have people who are experts, speak at their meetings, resulting in lively and highly interesting discussions.

(h) Temperature in all the cities I visited was ideal to grow Amaryllis in the open, but though my fuel-bill is a regular nightmare here in Holland, there are also a good many disadvantages and drawbacks when Amaryllis are grown in the open, which I cannot help mentioning.

THE NEGATIVE SIDE

(a) Amaryllis-lovers are so enthusiastic that they refuse to remove Amaryllis that obviously suffer from Mozaic-virus. I was often impressed that some people did not know what Mozaic-virus was, in which case I explained the term and the phenomena to them, for Mozaic-virus can be detected easily enough by examining the foliage.

The worst of it is that the disease spreads like wild fire; there is a legend that one virus plant infests the other, but as legends are meant for the superstitious, I do not believe them and I am convinced that when an Amaryllis plant has contracted virus, the disease is spread by insects sucking juice from the foliage of a virus infested plant, then flying to another healthy plant, sucking its juice and spreading the disease in this way. Secondly the virus infested plant may contaminate the soil, so that future Amaryllis planted in the same spot may again be infested, for which reason we sterilize the soil in our hothouses every year before planting the bulbs.

Finally the virus will develop to such a degree that the foliage turns yellow with green spots, affecting also the flowers, so that it is not true what a good many Amaryllis-lovers assert that virus infested Amaryllis produce perfect and normal flowers.

(b) Though American Amaryllis-lovers do not grudge work, they should have their soil inspected by the American Plant Inspectors, when the results are not satisfactory.

They spend a good deal on fertilizing, which is no good; if they do not know what is wrong with the soil, any attempt to remedy it, will be a leap in the dark, unless they know the composition of the soil.

I have found in the States I visited, i.e. Texas, Louisiana, Alabama, Mississippi, Florida, Georgia, North and South Carolina, that generally speaking the pH (degree of acidity) of the soil is far too high (from 8 to 12), which should be reduced to somewhere between 6 and 7.

The alkalinity of the water in these States is also of great consequence, but if watering is done after 4 PM, the damage will be less than when one waters during the hottest part of the day, i.e. between 10 AM and 4 PM.

(c) The Amaryllis and Garden Clubs should bring home to their members that selferosses or "selves" lead inevitably to inbreeding, which is against nature, causing degeneration in the long run. Never cross one bulb of a variety with the pollen of another (or of the same bulb for that matter) bulb of the same variety.

(d) Amaryllis flowers for shows are always grown best in greenhouses, where watering is under control and where insects can easily be killed by spraying the plants with some disinfectant, which will prevent them from catching all kinds of diseases.

In principle I should be in favor of killing off as many insects as possible also in the open. Of course, if one's neighbor does not spray, it is of little avail, but nowadays everybody is struggling with insects, so why not do a thorough job, starting in the yard or garden?

(e) With the aid of several American Amaryllis growers who know their job I have drawn up planting and fertilizing directions. These are given in detail in another section of the present AMARYLLIS YEAR BOOK.

(f) Amaryllis shows are meant to popularize Amaryllis with the public at large; keen, but fair competition is all right, but prize-hunting

with unfair means will kill the enthusiasm in the local Amaryllis and Garden Clubs.

(g) Temperature in the open cannot be controlled, but the preparation of the beds could be done in accordance with the Planting and Fertilizing Directions.

Some people in Houston, Corpus Christi, San Antonio and many other cities have managed to grow one and the same bulb successfully for more than 15 years. Of course, fertilizing is necessary in this case, for when the bulb has done flowering, it feels like a sponge and should be restored to normal size, but if the soil of the bed is nutritious and has the correct pH, half the work is already done.

(h) Many Dutch bulbs start sweating in transit, due to a sudden change in temperature; they sometimes lose their roots and show reddish and brownish spots, called Red Neck disease or technically Stagonosphora.

Delay in delivery from the American port of entry to destination seems to be inevitable in some cases, though I am sure that such delays could be avoided when shipping agents were somewhat more conscientious, but the disease can easily be cured; on arrival the bulbs should be thoroughly cleaned, or rubbed clean with sand; and then applying Dura Dust (50% D D T) and putting them aside in a cool place for about 48 hours and letting them dry before planting. One New Orleans customer told me that bulbs suffering from Red Neck disease had been thoroughly cleaned by him, after which he put them under the water tap, washing away what little rot was left, drying them thoroughly before planting them, and his success was enormous.

I was glad to find that a good many people grew Amaryllis successfully, as they had found out most of these things themselves. I have admired beautiful lots of Amaryllis, entirely virus-free all over the States I visited, and I was really thrilled to find a married couple in Valdosta, Georgia, having thrown more than 4,000 Amaryllis on the scrapheap, turning over a new leaf, when they noticed that the bulbs were infested with Mozaic-virus; of course, they should have selected the lot a few years earlier, in which case they might have saved a fair percentage of the bulbs, but then it takes courage to admit a mistake and to take the necessary measures to correct it, especially if such measures cause a substantial loss of precious Amaryllis.

(i) When visiting Florida, I was welcomed by a hurricane ("Abbie"), and one day there was 15″ rain, which spelled ruin to a good many plants and bulbs including Amaryllis.

Heavy showers and torrents are nothing out of the common in areas where Amaryllis can be grown in the open; drainage is generally very poor. Why not plant the Amaryllis in beds, the tops of which are brought 4″ above the surrounding garden areas, so that there is sufficient drainage?

(j) I happened to spot aphis or aphids (plantlice or greenfly) in the yard of a well-known Florida Amaryllis grower, who was evidently

not much impressed when I drew his attention to this danger. I may point out to you here that aphis is very stubborn, once it has spread. Any insecticide will kill aphids, but then they have generally already laid eggs, which are not destroyed by spraying, so that the treatment should be repeated at least three times with a week's interval. As soon as you discover a wooly stuff on the foliage or between the leaves, you may be sure there are aphids, so start spraying, for aphids multiply more rapidly than rabbits.

Prevention is better than cure; five weeks after planting our Amaryllis we start spraying them for the first time with Parathion to kill all insects, including aphids, and we repeat the treatment four or five times with a fortnight's interval.

I know that in some areas in the U. S. A. you may not use Parathion *which is indeed very poisonous,* but then your dealer will know of an adequate substitute for Parathion.

Considering everything I am fairly optimistic as to successful Amaryllis growing in the open in the U. S. A. Mistakes are made, wherever work is done (and U. S. A. Amaryllis growers do a lot of work), whereas the average American Amaryllis-lover is eager to learn, so that his constant endeavors are bound to be attended with success.

A friend of mine in Corpus Christi expressed himself as follows: "I hope to hear you say in three to five years that your Amaryllis shipments to the States have doubled. This I know can be done, for the surface has hardly been scratched so far". Let us continue scratching the surface, for beauty, though a rare thing, can be created in your yard and garden with some effort and will give you much joy and satisfaction.

ALEK KORSAKOFF

An Autobiography

Our venerable Editor, Dr. Hamilton P. Traub, asked me to write something that would "do justice to (my) eventful and useful life." "Eventful" can be accepted, but "useful" is debatable.

My Odyssey (or would it be better to call it a Saga?—There may be a drop or two of Viking blood in my veins), if indulged in to the limit, would fill much more than one issue of the Yearbook.

CHILDHOOD, 1894—1910

As recorded officially, I was born twice—Febr. 17, 1894 (Julian Calendar), and March 1, 1894 (Gregorian Calendar). I inhaled the then almost unpolluted air in Porohovaia Sloboda, a suburb of the City of Kazan, on the Volga River. There I spent all my time until 1913. My native town is located several miles from Kazan, and included then the military post guarding the Porohovoi Zavod (Gunpowder Plant)

and housing facilities for thousands of employees, including my father. Primeaval forests surrounded it and the Powder Works.

In 1903, at the age of 9, I entered grammar school; finishing it in 1906. I then attended the City School, somewhat equivalent to Junior High School. My father had passed away, and mother was not able to enforce my taking French and German (languages being elective). In 1910, I graduated, second in the class minus languages. "The elbow is very close but try and bite it."

CALM BEFORE THE STORM, 1910—1915

I was first employed as a messenger boy in the Powder Plant and shortly after moved to the Plant Chemical Laboratory. When my eyes started bothering me, the doctor advised me to quit the Laboratory. With the recommendations of the Plant officials, I entered the provincial branch of the Church Synod with the first rank of a Civil Service Officer. I did not like the gloomy office and church squabbles and decided to be a Medical Doctor (M. D.) Having insufficient education to enter University, from the "front", I laid plans to storm it from the "rear". Obtaining tutoring in Latin, I passed the examinations, and was ready for a pharmaceutical ladder to doctorship.

The time came when I must leave my forest and floodlands of the Volga—flower gathering in spring time for the market; gathering mushrooms in summer for mother's lay-a-way; nutting in the fall (the best nuts being stolen from the squirrels); fishing in the Volga for sterlet and carp in forest lakes; catching birds in winter. . . .

I can never forget my first and only flight so far. Carefully placed crow's eggs in my pocket, I started down from the nest and went faster than planned—there I was hanging by what was left of my pants, about 12 feet from the ground on a stub of a broken limb. I have had no recollection of the passage of about 30 feet between the nest and the saving stub, then or have now. However, I came down whole excepting for the pants. Don't ask about the eggs.

No more winter skiing over the woods and fields, tracking foxes, snaring hares, meeting moose; no more bringing home in early spring wild roses, Mountain Ash, Weeping Birch to plant alongside Mother's lilacs, raspberries, gooseberries, etc. No more expecting another winter when sparrows, flying from under eaves, would fall frozen; or one with a warm spell that would gloss everything during rain around Christmas time.

In 1913, I found myself in northern Caucasus on the shores of the Kuban River as an apprentice pharmacist in a drug store. The vegetation was different; fishing was different. All else was different—peach and apricot orchards acre after acre; miles upon miles of sunflower fields harboring wolves; grapes and wine, and no woods at all.

Two years passed, I was back in Kazan to enter the University with courses leading to assistant pharmacist's grade on the "ladder".

Fig. 2. Aleksey Stepanovich Sosipatrov-Kuznetzov (later John Karl Johnson and Alek Korsakoff) in the field uniform of the Russian Imperial Army before 1917.

THE STORM, 1915—1920

Mobilization! September 8, 1915, in the Army! By September 12th in Samara in the 102nd Reserve Infantry. March of 1916 found me in the Military School, the same one that allowed my Sokal Athletic Club the use of its gymnasium. June 15, 1916, I was commissioned an Ensign in the Russian Imperial Army. I was left in the school as assistant instructor for the next class. In October, I was ordered to the Noncom School of the 164th Reserve Infantry. Back in my woods again! There the Revolution caught up with me. The day the regiment mutinied every single officer fled the Regiment environs except myself. I was trapped in the barracks of the school.

Before the actual revolt in my regiment, all live ammunition was brought to the school. The fact being that no one likes noncoms, my charges were as badly off as myself. We decided to stay put and let it be known that any one appearing in the open space around our barracks would be shot on sight. We posted sentries at every door and window, and waited to see what would happen next. Night came bright, the snow was white, and there was no attempt to set our barracks on fire.

Morning came, everything was quiet. About noon, every one who did not desert elsewhere got hungry. The quartermaster in the City refused to issue anything without requisitions signed by a commissioned officer. There was a meeting with the result that I was a Regimental Commander for two whole days!

By September 1917, I was in the trenches at the front in Poland, a member of the 30th Siberian Sharpshooters Regiment. To break the trench monotony in October, I volunteered for the Strike Battalion of Death of the 8th Siberian Sharpshooters Division. Once I was slightly gassed, once I had a bullet make a hole in my hat; another time one passed through my coat. Many "pinged" around my head but the only scratch I acquired was when I fell head first, one dark night, in a trench.

Attaining by that time the rank of Staff Captain, I and my orderly, I in disguise, deserted December 2nd, 1917. He went home, I planned by some chance to get to France and the Russian forces still fighting there. On the 10th of December, my sister being dead, I bid my mother Good Bye . . . for the last time.

In Siberia, I got in a scrap with the train commissar. He stopped the train, a kangaroo court was set to try me—the proposed punishment, putting me under the train, was about to be accepted when my orderly, a real "dyed in the wool" Sibiriak (Siberian) started talking. A new commissar was chosen and the train chugged on. My orderly begged me to go to his father's farm. Time came for him to change trains, we parted. . . .

On the 31st of December, I was in Harbin, Manchuria, and at the U. S. Consulate was refused crossing America on the way to France. There was no work to be found, and I had plenty of time to visit all

parks, cemeteries, and City nursery, which were well provided with vegetation, all new to me. When my money was dangerously low, I had only three or four decent meals in a week. Fortune smiled on me on April 17, 1918. I was employed as a Laborant in the Pharmaceutical Department of the Chinese Eastern Railway's hospital. Fall found me as a YMCA Physical Director in one of the High Schools. My first contact with America.

Fig. 3. John Karl Johnson (born Aleksey Stepanovich Sosipatrov-Kuznetzov) in the U. S. Army, 1920-1921, Manila, Philippine Islands.

In March 1919, Kolchak arrived, and I was in the Army again. When the Allies came to Siberia, I was assigned as a liaison officer to an American detachment guarding a stretch of the Far Eastern Railroad. When on patrols, I paid more attention to vegetation than anything else, although one time crossing a creek, the lieutenant in charge, and myself found gold flakes in the sand.

FROM MANILA TO AMERICA, 1920—1922

On February 15, 1920, Co. E. 31st Infantry, packed me in the hull of the S. S. Great Northern, and on the 24th I arrived in Manila.

In a few days, the F. B. I. was scouring town for a Russian; on March 18th, a native son from the "Windy City", named John Karl Johnson, became Pvt. of Co. E. 31st Infantry, U.S.A., and there was no Russian "any more."

Everywhere were tropical trees, shrubs, vines, flowers; and sugar cane, and tomatoes. All the fruits. Days, weeks, two years roaming the environs of Manila in the bamboo forests watching iguanas, in 10 to 12 feet deep cool and moist gullies full of Java sparrows and some of the tiniest birds flitting around. The king of all fruits, the Mango by the bushel.

At the end of 1920, John Karl Johnson decided that he had picked up enough English to be able to stand on his own two hind "laigs", and after a trip to Peking, China, to enjoy the swallow nests, and best ever glazed sweet potatoes, he left his Co. E friends. On January 20, 1921, he became a pharmacist in the Sternberg General Hospital dispensary in Manila, but just for a few days. Soon he found himself in the hospital medical supply room, where the Sarge in charge in a few months left the inventory in almost his sole hands.

THE HAVEN OR "HOME" AT LAST—1922 TO PRESENT TIME

In March 1922, the "native son" left the oleanders, and Night-blooming Jasmine, *Cestrum nocturnum*, in full bloom and started "back" to the good old U. S. A. and Chicago. Hawaii passed by, and by April 3, John K. was on the Angel Island in San Francisco Bay surrounded by giant Eucalyptus trees, and the most virulent poison ivy, gazing on beautiful Alcatraz. After April 29, my home, sweet home was Camp Lewis for the rest of my army life. There, as a Room Orderly, I had the most enjoyable days roaming the surrounding woods, berrying in time, appling in time in abandoned orchards; flushing pheasants. . . .

I was discharged on March 16, 1923, naturalized on the 26th. The judge, after hearing my name, Aleksey Stepanovich Sosipatrov-Kuznetzov, said: "Sayitagain." I did. Said he, "with a name like that, you will have no chance at all." "Think of something simple and short," he continued. Said I, "Aleksey Stepanovich Korsakoff, the last name of my uncle." Well, the musician, all right; but let's drop the "Stepanovich" and cut off "sey" from "Aleksey", was his come-back. So Alek Korsakoff was born; but not smart Alec, but Alek. This is the fifth and final name that I have been masquerading under since leaving my childhood home in Russia.

First I worked for construction and lumber companies, and then in October joined the American Legion, and entered the College of Forestry, University of Washington in Seattle on probation due to no papers of previous schooling. However, at the end of the second quarter, it was

agreed that seven years in Russian schools was sufficient, and I became a regular student.

Then followed work in the Forest Service, in the Rainier National Forest in summer, and afterwards Malmo Nurseries in Seattle. About this time the marital troubles of my aunt's adopted daughter, Elena Korsakova, and my childhood playmate, came to a climax. She was divorced. My mother was dead, and she was the only link with the childhood days. "Want to marry me? This is the only way I can bring you to America." "I will" was the reply. No more college for me.

Fig. 4. Alek Korsakoff (born Aleksey Stepanovich Sosipatrov-Kuznetzov), the amaryllid enthusiast, among some of his favorites in Florida.

Closer to the Atlantic. In October of 1925 I worked for the Carolina Flower Store, Charleston, S. C., then Washington, D. C., and passport, visas and New York in December. Bronx and the New York Botanical Garden, Central Park and the Zoo.

On January 20, 1926, I was married and had a fine four-year son in the bargain. Barely enough money for the honeymoon—Germany, Holland, France, Spain, Cuba.

On June 7, we were in Miami. In a few days my wife started working as a dishwasher in a restuarant on June 14, temporarily until we got settled; on June 14th I was employed in the City Nursery. In July 1927, I was practically in full charge of the Miami City Cemetery as a caretaker. The Cemetery Sexton was in charge of the Bayfront Park, and spent his time there. Later, I became the Sexton and stayed there until retirement in 1962.

During my time the 10 acres of Cemetery grounds became a Botanical attraction, second in Miami only to Chapman Field, the Government Plant Introduction Station. Botanists visited the Cemetery, the College of Forestry, University of Miami, used it for field studies. Dr. Small's (N. Y. Botanical Garden) seed of *Platanus orientalis*, collected in Manhattan, grew well, and Dr. Small never missed a visit when in the vicinity. Dr. Fairchild and I exchanged visits, he to the Cemetery, and I to the Campong, his home. Then the Fairchild Tropical Garden was founded, and the Cemetery was forgotten.

During the late twenties and early thirties, a group known among themselves as Floragoofs often met and had discussions and arguments. Participating were Dr. Swingle, Sr., Dr. Buswell, Dr. Alexander; sometimes they were joined by Dr. Gifford and Mr. Johnny Lynch. The botanists had the interest and the knowledge, I had interest also, ten acres to plant in, unabated desire to watch development and always ready to report. As time passed and many of the Floragoofs passed on to better hunting grounds, my interest in trees, shrubs and vines diminished. The Cemetery was full of maturing and even aging plants, but in the yard there was ample room under the two Avocados, a Rose Apple tree, an Egg Fruit tree, a Sugar Apple and the Sour Sap. By and by my interest turned to smaller things—succulents and a few cacti, then Bromeliads, and Lo! *Amaryllids*.

In 1956, Mrs. Clint sent me a dozen or so species of *Zephyranthes* collected in Texas and Mexico. Since then I am a Rain Lily Goof, or rather, a Zephfan. In addition to a few *Amaryllis* species and other amaryllids, there are also miniature Gingers and a few things in other families. I enjoy 24 accessions in *Habranthus*, species and hybrids; two *Pyrolirions*, two *Sydneyas*, 159 *Zephyranthes*, species and hybrids. These include at present more than 50 of my own crosses. God is good! Praise be to Him!

After naturalization, my wife "Ellen" died in 1962. After 36 happy years, I was left alone. Her boy, my adopted son, is married and lives in New Jersey. Now I had only my plants to worry about, I retired. Later, through correspondence dealing with Amaryllids, I got acquainted with my present wife, Mrs. Meta M. Samples and we were married in 1964. I am afraid she is more a Floragoof than I. Her present interests are *Amaryllis* species and hybrids, Amaryllids and Orchid Cacti. So we have our squabbles. Our 18′x60′ greenhouse is divided. I rule one half, she the other. The other smaller one is wholly hers. She rules the yard with beds of *Amaryllis*, *Lycoris*, Rhodophialas and what not. God is good! Praise be to Him.

HERBERT MEDAL PRESENTATION TO DR. ROBERT P. KAHN

In a ceremony at the annual dinner of the Potomac Branch of the American Phytopathological Society, Dr. Wilbur D. McClellan, Assistant Director of the Crops Research Division, Agricultural Research Service, U. S. Department of Agriculture, presented the 1968 WILLIAM HERBERT MEDAL to Dr. Robert P. Kahn, March 27, 1968, on behalf of the American Plant Life Society (Fig. 6.).

Fig. 6. Dr. Robert P. Kahn (left), virologist of the Plant Quarantine Division, A. R. S., U. S. D. A., receiving the 1968 William Herbert Medal from Dr. Wilbur D. McClellan, Assistant Director of the Crops Research Division, A. R. S., U. S. D. A., on behalf of The American Plant Life Society.

EDITOR'S MAIL BAG

Mrs. Marei Splinter (Mrs. A. C. Splinter), Zelgliweg, Maniken, Zurich, Switzerland, writes under date of June 23, 1968, that her husband, A. C. Splinter passed away a year ago, and that he kept up his interest in the amaryllids to the end. His many friends in the United States will greatly miss him.

EDITOR'S MAIL BAG—continued on page 32.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE 1968 OFFICIAL AMARYLLIS SHOWS

The Amaryllis shows began on April 6—7 with the Official Men's Amaryllis Club of New Orleans Show with horticulture exhibits; including arrangements exhibits sponsored by the Garden Circle Amaryllis Club of New Orleans. Then followed the Official Houston Amaryllis Society Show, on April 20; the First Official Amaryllis Show sponsored by the Amaryllis Society of Baton Rouge, Louisiana, on April 21; the Official Coastal Bend Amaryllis Society Show, on April 27—28; the Official Amaryllis Show sponsored by the Amaryllis and Hemerocallis Society of Southern California, also on April 27—28; and the Official Greater Houston Amaryllis Show, on April 28.

The Official Hattiesburg (Miss.) Amaryllis Society Show had to be canceled due to inclement weather. The Hattiesburg members and the American Amaryllis Society mourn the death of Mrs. William H. Sparrow, who died on April 25, 1968. Mrs. Sparrow had been active in staging the local shows. No report has been received of any show at Mobile in 1968.

1968 OFFICIAL AMARYLLIS SHOW OF NEW ORLEANS

James E. Mahan, *3028 Palmyra Street, New Orleans, La. 70119*

The Official Amaryllis Show of New Orleans was held on April 6 and 7, 1968 at the Edward Hynes School on Harrison Avenue and represented the combined efforts of the Men's Amaryllis Club of New Orleans, Inc. and the Garden Circle Amaryllis Club. The horticulture section was sponsored by the Men's Club and the artistic arrangements by the Garden Circle Club. This was the first time that these two clubs had joined forces to stage a very well received show.

In the artistic design division the Tri-color was won by Mrs. W. H. Lake, and in the creativity division Mrs. John A. Hennessey took the honors. Both presented very striking arrangements.

The horticulture section attracted many entries with the following trophies being awarded: Mrs. F. J. Cuquet, Sr., the W. R. Latapie trophy for the best registered, named specimen and also the Ludwig challenge cup; Mr. Lester L. Laine the Norman Clements trophy for the best un-named and unregistered specimen; and Mr. Milo C. Virgin the Reuter Seed Co. trophy, the James Mahan trophy, and the Swetman Amaryllis Garden trophy, all sweepstakes awards. American Plant Life Society Awards of Merit went to Mrs. E. J. Cuquet, Sr. and Mr. W. J. Perrin; Preliminary Commendation Awards to Messrs. Milo C. Virgin, Lester L. Laine and W. A. McCollum.

Good weather contributed toward a fine turnout in the way of show entrants as well as visitors, not only from New Orleans but from the

surrounding areas as well. The numerous compliments from the visitors were very heart-warming and made all feel determined to put forth an even greater effort for the following year's show.

OFFICIAL HOUSTON AMARYLLIS SOCIETY SHOW, 1968

Mrs. A. C. Pickard, *Show Standards Chairman, 1702 North Blvd., Houston, Texas 77006*

The Houston Amaryllis Society Official Show staged under the standards of the American Amaryllis Society at the Garden Center in Houston, Texas, April 20, 1968 was a perfect fulfillment of the theme "Amaryllis, Queen of the Spring".

The consensus of the overflowing crowd was that an excellent Amaryllis show of garden grown specimens can be beautiful in spite of the abnormality of a cool spring.

One of the main attractions of the show was the Artistic Section in which the theme of the show was appropriately carried out.

The educational Exhibit on methods of propagation of Amaryllis included all stages of growth from seeds to the mature clone.

A special table on Conservation with informative information was well received.

The Junior Section received the Junior Achievement Award in the Educational Division as well as blue ribbons and trophies for cut Amaryllis specimens.

The Society has enjoyed a long span of productive years and its basic functions have remained constant. The ingredients which went into its foundation account for much of its accomplishments.

In the Horticulture Section the following received the highest A. M. and H. A. S. Trophies:

'Apple Blossom' (Lud.) cut Specimen, R.A.422 D.5.A.—A.M. Mrs. L. E. Morgan.

'Prince of Orange' (Warm.) cut Specimen R.A.506 D.5.A.—A.M. Mrs. Tracy T. Word.

'Bellina' (Lud.) pot plant R.A.856 D.5.A.—A.M. & Ludwig Challenge Cup. Mrs. L. E. Morgan.

Miniature (Lud.) 'Fire Fly' R.A.469 D.8.A.M.—Mrs. John Baird.

Breeders Class-Dutch Seedling P.C.—Dr. E. M. Yeats.

Breeders Class-American Seedling—P.C. Dr. E. M. Yeats.

Non-Competitive 'Doris Lilian' (Lud.) R.A.431 D.5.2.—Mrs. Leon Cox.

Non-Competitive - American Hybrid - non-registered D.9.—Mrs. Richard June.

Sweepstakes-awarded to H. A. S. Member—Mrs. Tracy T. Word.

AMARYLLIS SOCIETY OF BATON ROUGE OFFICIAL SHOW, 1968

FRED J. BUCHMANN, *Show Chairman,*
1766 Avondale Dr., Baton Rouge, La. 70808

The Amaryllis Society of Baton Rouge held its first official show on April 21, 1968. At this time of year, greenhouse plants have nearly finished blooming here and outdoors plants are nearing their peak bloom. This was in keeping with the philosophy that for a first show it would be better to have a reasonably large number of specimens including cut scapes from outdoors rather than a lesser number of potted, greenhouse plants. This objective was achieved in the competitive horticulture sections with a total of about 140 scapes having at least three florets, about 50 of which were potted plants. Ten very artistic arrangements, each containing at least one Amaryllis floret, were contributed by ladies representing a number of local garden clubs. In addition, about 35 single florets, including several in the double division (D-7), were on exhibit and a massed display at floor level of about 70 additional scapes added to the color of the occasion.

In competitive horticulture, six certified judges awarded 86 ribbons: 28 first, 17 second, 23 third and 18 honorable mention. Individual awards were made as follows: Best, potted, registered flower in Division 5, the Ludwig challenge cup and an American Plant Life Society Award of Merit went to Al Diermayer for 'Beautiful Lady.' In the Division 5 competition a close second and an Award of Merit went to J. T. Schmidt for 'Fairyland.' Winner of the best small flower award was B. A. Tower for a potted plant of *A. cransiae.* Mrs. T. K. McKnight received a green ribbon for the best single floret, an unregistered, very greenish white; and Mrs. Jack Welch won the top award in the arrangements for her entry in "Amaryllis on Parade." Three unregistered seedlings in Division 5 received American Plant Life Society Preliminary Commendation awards, two grown by Al Diermayer and one by Clarence J. Crochet. Both sweepstakes awards for most blue ribbons for potted plants and also for cut scapes were won by Clarence J. Crochet.

We were also fortunate to have an outstanding exhibit of more than 60 beautiful flowering orchids by the Baton Rouge Orchid Society and these added significantly to the show.

While we feel that some improvements can be made at our next show, we believe our first show was a very worthwhile event.

CORPUS CHRISTI OFFICIAL AMARYLLIS SHOW, 1968

MRS. CARL C. HENNY, *Vice-President,*
P. O. Box 3054, Corpus Christi, Texas 78404

The Coastal Bend Amaryllis Society held its ninth annual Amaryllis Exhibit in conjunction with the Lola Forrester Flower Show which was held in the City Coliseum for the first time, on April 27th and 28th, 1968. The Texas Garden Clubs, Inc. Convention was held here during March 27th and 28th, so we were really late this year. However, we were very fortunate in having sixty-two entries for judging after all.

Fig. 7. Mrs. R. A. Hornberger, winner of the Ludwig Challenge Cup at the Official Corpus Christi Amaryllis Show, 1968.

Among the pot-grown Registered Leopoldii Type Amaryllis exhibited were: 'Apple Blossom', 'Daintiness', 'Picotee Petticoat', 'Golden Trumphetor', 'Day Dream', 'Fantasy', 'Royal Dutch', and 'Marion'. The Garden Grown Registered Leopoldii Type included 'Apple Blossom', 'Prima Donna', 'Pink Favorite', 'Winter Carnival', 'Indian Orange', 'United Nations', 'Picotee Square Dance', 'Candy Cane', 'Ludwig Dazzler', 'White Giant', 'Maria Goretti', and 'Royal Dutch'.

Mrs. R. A. Hornberger received 97 points on her pot-grown 'Picotee Petticoat' and was awarded the Ludwig Challenge Trophy for the second time (see Fig. 7). She also received the Judges Award of Merit and the American Plant Life Award of Merit for this lovely specimen plant. She also received a blue ribbon on her entry of 'Daintiness'.

Mr. R. L. Retallack received a "Special Trophy" awarded him for his entry in the "Breeder's Class". Mrs. Bill M. Miller, a non-member, received a "Special Trophy" for her entry of 'Winter Carnival', in the Registered Garden Grown Leopoldii Type.

Mrs. Carl Henny received blue ribbons on her entries of 'Picotee Square Dance' and 'United Nations'. She was also awarded the American Plant Life Award of Merit for 'Picotee Square Dance' which scored 95 points. American Plant Life Awards of Merit were also awarded to Mrs. Robert B. Arnold for her entry of 'Firefly' which scored 96 points, and to Mrs. Levi Materne for her entry of a Belladonna which scored 95 points.

Other blue ribbon winners were Miss Winnie Joiner, for her entry of 'Apple Blossom', which scored 94 points; and to Mr. Richard Blucher in the Breeder's Class, which scored 94 points also. Mr. W. M. Neyland was awarded a blue ribbon on his 'Golden Trumphetor' entry and also a blue ribbon in the "Breeder's Class".

Three Accredited National Amaryllis Judges from San Antonio, Texas, Mrs. E. T. Story, Mrs. Larry Miller and Mrs. R. H. Parkinson judged our Exhibit.

1968 SOUTHERN CALIFORNIA OFFICIAL AMARYLLIS SHOW

Joe Werling, *Show Chairman,*
5139 Hermosa Avenue, Los Angeles, California 90041

As usual with our shows in Southern California we have many anxious days preceding our events wondering if we could collect enough exhibition flowers. Our Fourth Annual Show, "Amaryllis-Spring Fantasy" was held on April 27 and 28 at the Los Angeles State and County Arboretum, 301 N. Baldwin Avenue, Arcadia, California. [Fig. 8]

It has been our purpose to encourage the growing of amaryllis in the garden. Much effort is expended by our members to put on a show that will create this interest. We have found this to be rewarding as we note that each year an increasing amount of visitors see our show. As indicated by the multitude of inquiries, the garden enthusiasts are setting aside a choice spot in their garden for these sparkling, pastoral sweethearts of their garden.

Our exhibit entries were comprised mostly of cut scapes. There were sufficient entries of greenhouse pot-grown plants, especially the miniatures and species that added that extra interest.

The awards were as follows: SWEEPSTAKES—Cecil Houdyshel Memorial Trophy (for the most blue ribbons)—Mrs. Bert Williams, So. San Gabriel; RUNNERUP SWEEPSTAKES—Southern California Hemerocallis and Amaryllis Society Award—W. Quinn Buck, Arcadia; BEST NAMED DUTCH (other than Ludwig) 'Orion',—Mrs. Flores Foster, Long Beach; BEST GRACILIS—Joe Werling Award—Mrs.

Bert Williams, So. San Gabriel; BEST SEEDLING—Chairman's Award—Mrs. Eva Turnquist, So. San Gabriel; BEST SEEDLING—Runnerup—Mrs. Kenneth Anderson, La Canada; MOST BLUE RIBBONS in Divisions 2, 3, 6, 7 and 8—Hayes Award—Mrs. Bert Williams, So. San Gabriel; POPULARITY POLL—President's Award—'Golden Triumphator', Mrs. Flores Foster, Long Beach.

Others winning American Amaryllis Society Ribbons were, I. K. Rosoff, S. S. Harshbarger, J. Moramarco, I. L. Doran, C. D. Cothron Duncan Eader.

Fig. 8. Southern California Official Amaryllis Show, 1968, Arcadia, Calif. **Upper,** part of exhibits; **Lower,** trophies awarded. Photo by Jack McCaskill.

Southern California Hemerocallis and Amaryllis Society Special Ribbons—Mrs. Marie Turner, A. E. Angell, J. Moramarco.

Outstanding Flowers—'Courtesy', 'Amazon', 'Ludwig's It', 'New Orleans', 'Symphony', 'Pink Beauty', 'Rembrandt', 'Elvira Armayo', 'Orion', 'Golden Triumphator' and the seedlings.

The Judges were: Mrs. Kenneth B. Anderson, Mr. Quinn Buck, Mr. Roger Fesmire, Mr. Jack McCaskill and Mrs. Bert Williams.

Individual gardens were only open to Southern California Hemerocallis and Amaryllis Society members to compare notes on their hybrids, species and seedlings.

The success of any amaryllis show is also dependent on those who contribute flowers for the non-competitive section. To mention a few who have been so generous, we list the following:

Mr. E. A. Angell of Loma Linda, Calif., has been hybridizing for 27 years (see article on page 67, 1964 Plant Life). He has supplied flowers for all of the shows but in the very near future he plans to curtail the number of bulbs he now is growing, as Mr. Angell no longer has the time to continue with so many plants.

Mr. Bruce Claflin of Upland, California, grows Iris and Gerberas in addition to amaryllis. His first showing of amaryllis was in the 1968 Show. His growing grounds are much higher and colder than the majority of our gardens. His flowers are usually not in bloom in time for our shows, but this year, due to a warmer spring, he exhibited some fine seedling blossoms.

Mr. John A. Moramarco of Fontana, California, is a newcomer in amaryllis growing. He is fond of the Angell strain because of the hardiness. He plans to hybridize and improve this strain within itself.

Mr. Walter Horsey of Temple City, California has contributed hundreds of flowers for added color on our exhibition tables. His passing soon after our last show saddened the hearts of many of his friends in the amaryllis world. We are indebted to him for his many fine contributions.

Marie Turner of Temple City has probably grown amaryllis in the open ground in California longer than any living grower. Please note page 59 under other California Breeders in the Amaryllis Manual. She has been a constant supplier for our shows, and we can remember a green seedling of her's that was the hit of the show.

GREATER HOUSTON OFFICIAL AMARYLLIS SHOW, 1968

Mrs. Sally Fox, *1527 Castle Court, Houston, Texas 77006*

A veritable parade of color greeted visitors to the Greater Houston Amaryllis Club's fifth official show, held in conjunction with the Mens Garden Club Spring Show at the Garden Center on Sunday, April 28, 1968. [Fig. 9]

This was a good growing year for amaryllis, and you name it and you saw it! There were well over a hundred specimens, including the pure white (most popular) and the very delicate pastel shades of pinks into deep rose, salmons and on into the various shades of blazing reds to almost black red. Of course, the bi-colors were not passed by easily as they too drew much favorable comment from the guests.

The trophy table was heavy with beautiful, much sought after, silver prizes. Awards were presented as follows: Mrs. R. A. Fawcett—Ludwig Trophy for potted specimen 'Ludwig's It'. Mrs. Glen Melton—Silver covered dish for Ludwig's 'Sparkling Gem'. Mrs. Chas. Pease—Silver plate for American Meade potted specimen. Mr. E. Joe Pruitt—Silver shell for Dutch seedling. Mr. Kermit L. Warnasch—

Wagner silver tray for Sweepstakes. Mrs. Chas. Pease—Rosette for Sprekelia, "Other Member of Amaryllid Family".

Fig. 9. Greater Houston Amaryllis Club Official Show, 1968. **Upper left,** Mrs. Glen Melton, trophy winner in Miniature Division with 'Sparkling Gem'. **Upper right,** Mrs. R. A. Fawcett, Ludwig Trophy winner with 'Ludwig's It'. **Lower left,** Mr. E. Joe Pruitt, winner with Dutch seedling. **Lower right,** Mrs. R. A. Fawcett, Ludwig Trophy winner with potted specimen of 'Ludwig's It', and Mr. Kermit L. Warnasch, sweepstakes winner.

Arrangements featuring amaryllis were at vantage spots, and added much beauty to the show.

The educational exhibit, which clearly showed the visitors what can be done in this area with amaryllis was a point of much interest, with many questions asked of Mrs. Chas. H. Pease, who was most gracious in giving good growing hints.

Even though it takes from eighteen months to sometimes almost three years to produce a blooming size bulb you can bet a few visiting gardeners who have never tried their hand at hybridizing will do so after viewing the many ribbons presented for seedlings—the result of our own crossings, then growing the seed to mature bulbs. The American Plant Life Society is most interested in these novice hybridizers, and to encourage them further prepared Awards of Commendation which were presented for the best seedlings in the show. There were twenty-two ribbons awarded in this division, which clearly indicates what good results have been achieved.

These bold blooms naturally attract the growers of the Mens Garden Club, in which Mr. Kermit L. Warnasch is an active member and keen competitor. He shared his entries between the two shows; and in the Mens Garden Club show won the coveted Ludwig Trophy with a cut specimen of Ludwig's 'Maria Goretti', a beautiful white amaryllis. The men's division had quite a number of amaryllis and along with their usual extraordinary displays of horticulture and arrangements produced a great show.

Those who attended this joint show had the pleasure of an afternoon long to be remembered.

HENRY VAN WOESIK, A GUEST SPEAKER AT HATTIESBURG

Mrs. Loyd Bond, *Hattiesburg, Miss.*

Mr. Henry van Woesik of Ludwig and Company, Hillegom, Holland, was the guest speaker at the meeting of the Hattiesburg Amaryllis Society, May 29th at the home of Mr. and Mrs. Sam Forbert, 1910 Evergreen Lane.

Mr. Woesik is manager and controlling partner of Ludwig and Company, which is the world's largest grower and exporter of Amaryllis bulbs. Mr. Woesik, who is visiting his customers while lecturing, made Hattiesburg his only stop in Mississippi. Luther N. Davis introduced the speaker, who showed color slides of his plant nurseries and of many Holland gardens. This year Ludwig and Company added four new hybrids to their list: 'Marble Arch', an apple blossom colored clone; 'Moulin Rouge', an improved and darker Royal Dutch; 'Salmon Tower', a salmon color, which is the largest Amaryllis with the tallest stem. He stated that 'Gipsy Giant' is being offered again this season.

Previously, Commissioner Walter Parker greeted Mr. Woesik at the airport and presented the guest with an honorary Hattiesburg citizenship.

The welcoming committee which met Mr. Woesik at the airport included Mr. and Mrs. Sam Forbert, Mr. and Mrs. Davis, Mrs. R. A.

Fowler and Mrs. Katie Jackson. Members of the society and their guests had a buffet supper Al Fresco style. There were seventy-five amaryllis enthusiasts in attendance, including visitors from Columbia, Yazoo City, Jackson, Taylorsville, in Mississippi and Detroit, Michigan.

CATALOGS RECEIVED

HYBRID AMARYLLIS CATALOG, season 1968-69, Robert D. Goedert, P. O. Box 6534, Jacksonville, Fla. 32205. (A) Hybrid Amaryllis Seed, 1968-69; (B) Imported large-flowering Amaryllis, including Dutch Hybrids, South African grown Hybrids, and Harrison's Hybrids.

LUDWIG AMARYLLIS (18th EDITION), Ludwig & Co,m P. O. Box 18, Hillegom, Holland (received August 7, 1968); 32 pages and cover; profusely illustrated in color; listing current offerings of hybrid named registered Hybrid Amaryllis clones and *Cyrtanthus purpureus* (syn.-Vallota *speciosa*).

UNIVERSITY HILLS NURSERY, 1968-69 CATALOG, Claude W. Davis, 470 Delgado Drive, Baton Rouge, Louisiana 70808.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1968 Amaryllis Year Book (page 31), the following numbered Amaryllis Judges Certificates have been issued by the American Amaryllis Society: 170. Mrs. John B. Baird, 6 Westlane, Houston, Tex. 77019 (Horticulture only). 171. Mrs. Wm. T. Danes, 15421 Lakeview Drive, Houston, Tex. 77040 (Horticulture only).

EDITOR'S MAIL BAG—continued from page 22.

The new address of Mr. Sydney Percy-Lancaster is now *36/2 Cantonment Road, Lucknow, India.* He writes under date of August 6, 1968: "It is some time since I wrote you last. I was compelled to give up my job with the Indian Botanic Garden owing to damp quarters which had brought on an attack of arthritis. I went back to Lucknow hoping to 'vegetate' for I am 84 and not as vigorous as I would like to be. Unfortunately I came into a very hot period and got heat stroke. I then rushed up to Kasauli, a hill station near Simla, but the elevation was too high for me in my condition—it is a little more than 6000 ft.—and I developed an unbalanced state that caused me to fall for apparently no rhyme or reason. I had to remain till the monsoon broke on the plains and reduced the heat of summer. I went down by early July, and felt better immediately, then after a stay for a month in Delhi I came on to Lucknow. I am feeling much better and except for the trouble at night fall when I must have support, I am well again. . . . I don't think I will go to 'work' any more but just carry on taking things easy. . . ."

Prof. Penrith B. Goff writes under date of Aug. 26, 1968, that he has assumed duties in the Department of Romance and Germanic Languages in the College of Liberal Arts at Wayne State University, Detroit, Michigan 48202.

2. LINEAGICS

[BIOEVOLUTION, DESCRIPTION, DETERMINING RELATIONSHIPS, GROUPING INTO LINEAGES]

PLANT EXPLORATION TRIPS IN ARGENTINA

CARLOS GOMEZ RUPPEL, *Mendoza, Argentina*

I. WINTER TRIP, JULY & AUGUST, 1967

This current trip which included west, central and northeastern Argentina was my longest one and also the most productive that I have ever taken because of the material which was collected and the fine people whom I met.

Leaving Mendoza by "Belgrano" railroad on 16th July at 11:30 P.M., I reached "Dean Funes", Cordoba, near "Santiago del Estero" border at 7 P.M. the next day. There I spent the following two days going up and down the border and all the while making inquiries for *A. parodii* as this is the "home" area of the species. But unfortunately I found only two big bulbs one of which weighed a full pound. At this time, the species is dormant but I plan to be there again next December, when I have been told that *A. parodii* is in full bloom everywhere by the thousands!

From thence I went to Tucuman for two days and entered into Salta city which latter town was unknown to me and the many flowering plants growing in this area really surprised me. There, luckily, I met Mr. Filiberto Yanello, a young gentleman, who became a good friend of mine, and who, I hope, will be of great help in the searching out of the species which may be found in the wilds. Further, we did take two good trips together and in one trip, he took me about 40 kms. (about 25 miles from Salta into the "Camino Viejo de Tucuman" (Old Road to Tucuman) where we found a good crop of bulbs, especially, of a big *Amaryllis* species which I was told is pink and white, and another one which is a white scented *Rhodophiala* species. Both of these may be new to Science. In what may be a very promising trip during the next Amaryllis blooming season, we plan to go to "Amaicha del Valle" and to "Santa Maria" in Tucuman where apparently grow *A. Aglaiae, "red cochuna", A. immaculata, A. tucumana* and some others. After spending this week in Salta, journeyed northward and arrived at "Embarcacion" which is near the Bolivian border. There I got more *A. apertispatha* and *A. belladonna* species bulbs which may have possibly come from Bolivia. Then, I took a trip into "Oran" and got specimens of an enormous *Hymenocallis* sp. which may be either *fragrans* or *speciosa* (I presume). The amazing development of the species could be due to ecological factors for the plant is evergreen and it looks just like a giant *Eucharis amazonica.*

Then leaving "Embarcacion" and after 36 hours of travel, I reached Formosa to pay a visit to Mr. Carlos Carrara, who is both a close personal friend and a good collector of tropical plants. Several nice

field trips were taken. One was to "Palo Santo" which is 300 kms. westward into a good area, where after a few hours of exploration we found the place where *A. elegans* var. "*albostriata*" grows, of which we got many bulbs. At this place, this species is evergreen in the fields. Also, in Formosa I got more bulbs of *A. belladonna minor* and *A. belladonna major* which grow in the home gardens and which are of unknown origin.

After a week here in Formosa, I left and spent the day going to Resistencia, Chaco, Corrientes which is the Capital of the same province (State), then on to Posadas, Misiones, and, finally, all in the same day, reached Santo Tome, Corrientes. Here, I was very interested in getting more mature bulbs of *Amaryllis* species "Mrs. Sosa" in Santo Tome; here I had gotten them two years before from a home garden. I presume that it comes from south Brasil or Iguazu Falls, Misiones. It is noteworthy as it is a peagreen self *Amaryllis* of the Elegans Group. If I had found it in Peru, then I would have said that it might be *A. viridiflora*. Unfortunately I was given only 6 mature bulbs which I will send to my friends in California (USA). This species flowered this past summer (1967) in Jacksonville, Florida (USA) for Mr. Alek Korsakoff from whom I quote: "Amaryllis specie Mrs. Sosa" produced very unique flowers of "chartreuse green 663/1, R. C. chart."

Then after another week, I returned home in five days, from Santo Tome to Mendoza by way of Buenos Aires. Now, after exactly a month, I was sleeping in my own bed again.

II. MARCH 1968 COLLECTING TRIP INTO SALTA

Salta, which is situated northward of the 25th parallel in the tropic zone and was the home-base for this collection trip, is a modern, liveable city which while surrounded by mountains and at an elevation of 1,800 meters (s. l.) nevertheless has a mild climate and has the plant, animal life and the scenery to go with it to make it a further inviting place.

Among those that aided me, I am most grateful for the young gentleman, Mr. Filiberto Yanello, who kindly took me on his motorcycle to hunt for new and showy plant specimens, especially Amaryllids. On the 7th of March 1968, we took off for the trip into the "El Chamical" which is a small village of less than a dozen humble houses that they call "ranchos". Surprisingly the houses were provided with running water. There was also a police-station, which had been a "tin rancho", with one police-man. There was also a school which was the main building and was big enough, clean and comfortable. This town was reached thru endlessly winding roads which both curved about and climbed hill after hill which were luxuriantly covered with tropical flora. Many a stop was made to collect conspicuous specimens among those were a *Malvaceae* resembling Hibiscus, having 1½" wide blooms of deep yellow blotched brown in its center and bearing myriads of blooms and seedpods all at the same time. Further, we found a member of the *Labitae* (?) which was a climber with 3" long coral red flowers of pos-

sibly great horticultural worth; since no seeds were to be found, several roots were taken to Salta. Also in this area, 18-20 ft. cactus were to be found of which the poorer sort of the "ranchos" were built but the city-folk used the "timber" for ornamental furniture. Among the *Amaryllidaceae* found were *Habranthus brachyandrus* which were identified from their leaves, roots and habitat. In "Chamical," itself, were found some cultivated *Hymenocallis* plants of which several enormous bulbs were dug-up for identification. They told Mr. Yanello that a broad leaved red *Amaryllis* and another white one grew also in this area. After a long search, we found 3 spots that had the supposed species. Two of the spots were rather close to each other on the bank of a dry river. The bulbs were big and the leaves measured some 70 cm. long and 5 cm. wide. We were told that they had white flowers. Later, we located the third spot on the dry top of a low "cerro" (the local name of a mount, need not necessarily be high). On that "cerro" we found, happily, many, many bulbs of a broad-leaved *Amaryllis* sp. and one bulb of a narrow white-striate leaved species. We have given the collection number to the broad-leaved species as *A. Ch. 1-68* (*Amaryllis* "Chamical" 1-1968). We gathered plenty of this material for further study. And on the way back to Salta, we gathered *Tillandsia*, *Bromelia*, *Chlorcs*, *Kochleria* and *Oncidium* species.

On the next day, we headed 30 Kms. northward on the road to Jujuy to "La Calera" which was more humid and warm but with grand scenery. The flora was commonly ferns, Begonias, Cacti and Bromeliad species, including the interesting epiphyte *Tillandsia*. We saw large groups of *Kochleria* species with several different shapes to the blooms and a range of colors, with the ventricose vivid orange and yellow, and the trumpets mauve, scarlet, red, pink, etc. They appeared to be natural hybrids. But what I was particularly hunting for was *Alstroemeriales* in the area and was lucky to find some *Bomarea* spp. of which 5 plants, possibly, of B. *rosea* were dug up.

Our next area of search was on the 11th into the "Guemes". This area is both dangerous and the climate is hot. The city, "Guemes", is located 55 Km. Eastward of Salta. In this "Guemes" area, what complicates the collecting of *Amaryllidaceae* is the presence of snakes—*Ophidium* with lethal poison, the aggressive "Yararâ" (*Bothrops neuwiedii & Bothrops alternata*), the less dangerous "víbora de Cascabel" (*Crotalus terrificus*)—altho having the most "mortal weapon"—does warn us of its presence by the noise of the rattles at the end of its tail; and lastly, the "vibora de coral" (*Micrurus lemniscatus*) which is the most venomous, but human victims are fortunately very rare. Well, keeping a wary eye on the reptiles, we found a few Kms. northward of "Guemes" an *Amaryllis* species that was growing by the hundreds. It resembles *A. parodii* from the likeness of the bulb, leaves and habitat. The Folk told us that the flowers are long, green-yellowish trumpets. From among these, we gathered about 20 huge bulbs. Also, close to these were taken some bulbs of an Amaryllid which looked like a *Rhodo-*

phiala species. Both of these were found in an area where the thorny *Bromelia* species and the *Synadrospadix vermitoxicum* (Araceae), with its large ornamental, deciduous leaves, grow everywhere.

On the way back to Salta, we collected more *Tillandsia* and *Bromelia* species. One enormous, glossy green-leaved *Vriesia* species and an ornamental climber bearing deep coral red flowers in profusion (the same Labiate previously mentioned) were also collected. One additional warning to all about a small danger. In spite of the heat, do not carelessly take a bath in the clear streams of water to wash off the perspiration, and to refresh yourself. I sank happily into the cooling stream. But to my great surprise, on getting on the bank again, I saw my body literally covered by hundreds of little fleshy colored leeches (*Hirudus* sp.) that were difficult for us to take off. My friend, Yanello, had laughed a lot when he refused to join me in the water.

SOME AMARYLLIDS COLLECTED BY DR. RUPPEL

PAUL H. WILLIAMS, JR., *6128 Sundown Drive, Fort Worth, Texas 76114*

Due to the efforts of Dr. C. Gomez Ruppel many amaryllid species from South America are now being grown in various sections of the United States. We owe him a great debt of gratitude for his tireless hours spent in tracking down rare and unknown species of the Amaryllidaceae and attempting to naturalize them in comparable climates of this country. His reward will be eventual increase of world botanical knowledge.

A few years ago the writer received bulbs from that most active member of The American Amaryllis Society resident in Mendoza, Argentina. Among these were two *Habranthus* species received as *H.* "Barreiros" and *H.* "Burkart". Both have proven adaptable to the conditions found in Fort Worth and should be brought to the attention of the Society at large.

The first is a possible form of *H. robustus*, but Dr. Ruppel made known his doubts; its delicate light pink is evenly shaded throughout the flower. This species blooms, with or without foliage, at the same time as *H. robustus* and occasionally during the summer and fall. Flower size and seed set compare with *H. robustus* but the scape is shorter and bloom is more graceful. Its true relationship is left to the lineagicist to puzzle out. The writer has small seedlings of a supposedly white form. The above species was collected by Dr. Gomez Ruppel at Barreiros Beach, Florianopolis, Capital of Santa Catarina, South Brazil.

The second species is new! At least I have not located it in Herbertia or Plant Life. This one has been described as giving the appearance of a giant white flowered form of *H. andersonii rosea*. It blooms along with *H.* "Barreiros" but does not set seed as freely. "Burkart" has a light brown shading deep in the throat which is carried forward throughout the bloom as very fine veins of the same color. The general

effect is an off-white color. The flower appears to be sensitive to the amount of light received; being trumpet shaped in shade and open faced in full sun. This species is native to Entre Rios, Argentina and was given to Dr. Gomez Ruppel by his friend Father Arthur Burkart, an Argentine botanist.

A beautiful addition to the Belladonna Group of *Amaryllis* was received as *A.* "belladonna minor". This is another of the fast growing collection of miniatures. A dependable, free blooming species (3 scapes to bulb) which crosses readily and is self-fertile. The flower is a glowing shade of rose with a large yellow eye banded by darker rose. It blooms during late winter and early spring while in full foliage, which does much to enhance the picture.

Other species still await flowering, and will be reported on later.

NOTES BY AN AMATEUR COLLECTOR

J. L. Doran, *1117 N. Beachwood Dr., Burbank, California 91502*

The following notes are concerned with exploration trips that were made during four years: (a) 1964, August & September, Peru; (b) 1965, September & October, eastern Venezuela and southeastern Brasil; (c) 1966, October & November, southern Brasil and northwestern Argentina; and (d) 1967, October and November, Bolivia, northern Peru and Ecuador.

On October 10, 1967, I saw *Chlidanthus boliviensis* brought to the market in Cochabamba by Indians. Brilliant yellow with up to twelve flowers on a scape, and very strongly perfumed. It grows near the top of the Sierra Tachua to the north of Cochabamba. Bulbs were found at an elevation of ten to twelve thousand feet, growing in a clay soil. Cochabamba gets about eighteen inches of rain in two or three months then none until the next year.

Dr. Cardenas states that with the exception of *Amaryllis belladonna* and *A. reginae*, all the amaryllis he has found are growing in a subtropical climate, not in hot, humid areas. *A. starkii* has been found only in a small area which is about 150 kilometers west of Corumbá, Brazil. It grows in a nearly pure sand in sandstone mountains with the name of Sierra Santiago. Rainfall is about 40 cm. per year.

Amaryllis Cybister is found on the north and east slopes of Sierra Tumari growing in very rocky clay soil in partially shaded places. This area has no rain for nine months of the year.

Amaryllis psittacina is another species that grows usually on steep bare rock, which has a thin layer of moss on it, of course some dust and debris collects in the moss. I found that often the roots were two feet long in the moss which is wet every night by dew and at some seasons of the year by condensation of fog. Another noticeable thing about *A. psittacina*, almost always it is found at the side of a plant of *Vriesia reginae*. The *Vriesia* is usually a large one, probably eight to ten years

old and three or four feet in diameter. It would shade the rock and perhaps keep it cool. *A. psittacina* grows at an altitude of 1-2,000 meters at a latitude of 22 degrees south. There are several months of little rainfall but the wet season is during the hot months. In this area they have some very hot days and the rock gets very hot. In 1966, I traced *A. psittacina* for about one hundred miles to check its variability and found that the amount of white appearing in the flower was quite variable but although the range is extensive no pattern was apparent. Some plants grow at the base of the cliffs below where the majority grow. Careful digging showed that the root system was smaller in extent and the roots bigger in diameter. The soil grown bulbs were bigger and the flowers smaller.

Amaryllis striata has been seen south of the range of *A. psittacina* on the Cerro do Mar beginning at Campo Grande. We followed it for about a hundred miles but did not determine the end of its range because we went west from here. *A. striata* grows in this region in a rain forest area where they receive 4,000 mm. of rain. I found it growing in small level areas near the top of the mountain with scapes 60 to 70 cm. high and gorgeous, nearly orange flowers about 125 mm. in diameter with leaves nearly 90 cm. long in almost complete shade. This area has little diurnal change in temperature but gets near freezing on an occasional morning in the winter.

In 1966 we went west from Curitiba to the Rio Paraná where we found *A. reticulata* var. *striatafolia* growing. This bulb bloomed shortly after we returned to California. It was selfed and the resulting four seed produced three plants with no white stripes on the leaves.

I found the first plant of what I believe to be *A. santacatarina* about fifty miles north of Puerto Iguasú. It was in bloom with green spathe valves. Later I found many plants with the same flower two hundred and fifty miles south of this place with green spathe valves. I was told that there was an amaryllis—small yellow flowers in this area but did not find it.

At Puerto Iguasú I waited four days for an airplane which radioed in that it would not come because of a storm at Corrientes. Later radioed that if it came, would be too late to fly out that night—the airstrip was a narrow lane cut out of the forest with no lights or navigational aids. While waiting for the pilot to make up his mind, I went to an abandoned hotel near Iguasú falls where I found the whole front planted to *A. santacatarina* and all in bloom. What a blaze of color!! Upon returning to the airport, found that the plane was coming. It started to rain! Was now completely dark but the pilot said he would go. They put three kerosene lanterns about a foot apart at the end of the runway and a couple along the side. We took off in a blinding rain with the lightning crackling.

Species observed growing in northwest Argentina were *A. aglaiae* *A. immaculata, A. ambigua* and *A. parodii.* It was told that this area has a long dry period which must be observed if these bulbs are to prosper. The exception *A. aglaiae,* which is evergreen, grows in natu-

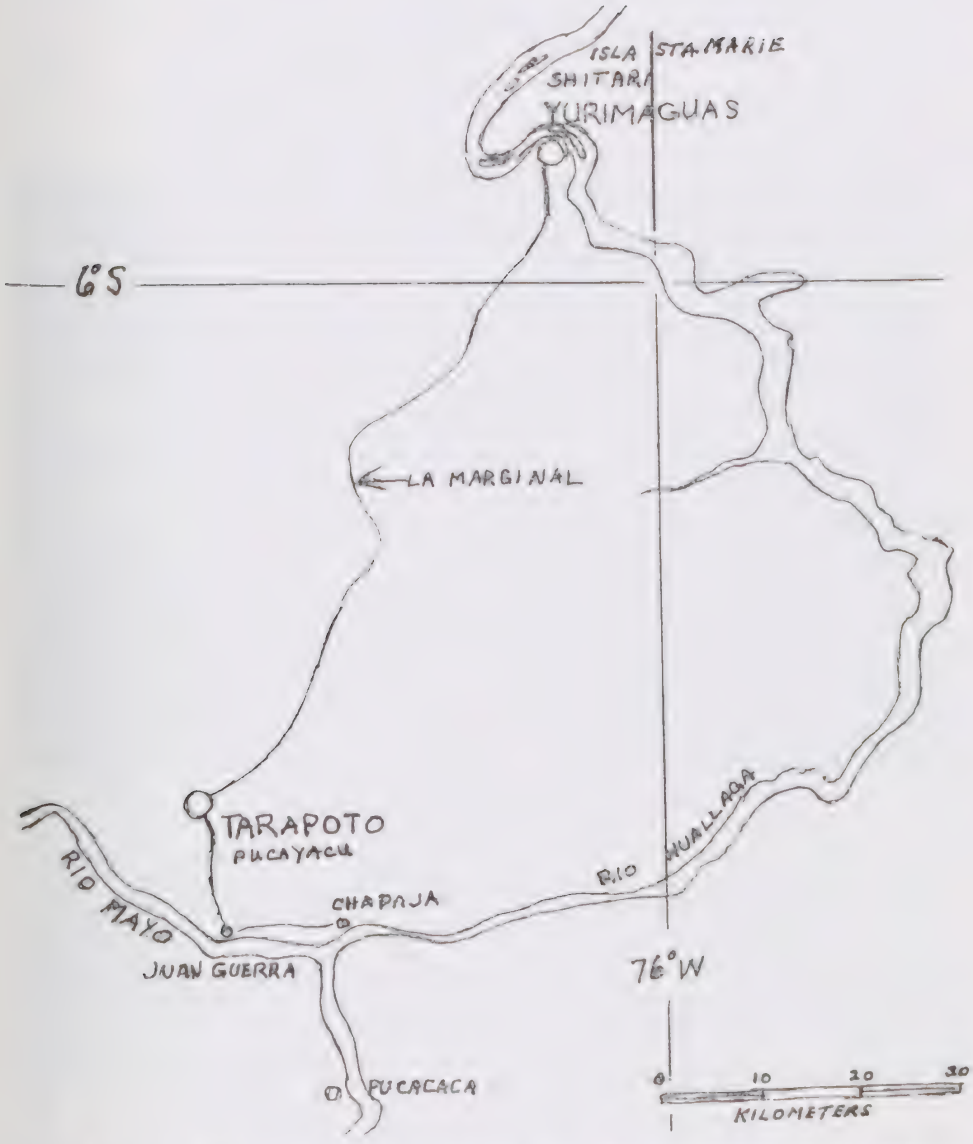

Fig. 10. Map showing the northern part of the Province of San Martin, Peru, in the upper reaches of the great Amazon River Valley where J. L. Doran collected amaryllids. Consult your atlas if more information is desired on this location.

rally damp places. A heavy shade from a summer weed crop protects it in the hot season. The soils of Argentina are clay loams, grey in color, rich in mineral—unlike the tropical red clays. In one area near Tafi de Valle, *A. aglaiae* was growing so thick it covered the sides of the barrancas. Near Vulcan, *A. immaculata* also was observed growing so close together you could not step without crushing some of the leaves.

Santa Cruz, Bolivia is a town of over 100,000 population and not one passenger car was seen here. Only jeeps or trucks; it takes four wheel drive to get through the streets. *A. belladonna* was observed growing all through the city and surrounding villages, in gardens and in wooded areas. Almost every flower set seed.

Also seen is probably *A. pardina* and in two distinct forms. One is dotted heavily with only a hint of striping (where the dots run together); the other is so heavily dotted that it is almost a solid color, but both are white on the back side of petals. Dr. Cardenas thinks these are "escapes" and were brought from the Rio Beni area by early colonists.

Travel to the south of Santa Cruz revealed an area becoming drier and with more cactus and bromelia. Hundreds of *Bromelia serra* were seen in bloom.

In 1964 we went from Juanjui up the river to Tinga Maria and across the Pacalpa. On this trip we found *A. reginae*, an unidentified one, and many *A. belladonna* of various forms and colors. The unidentified flower is white, trumpet shaped with a few fine red lines. Many *Eucharis grandiflora* plants were seen, but near Tinga Maria a very small flowered *Eucharis* was found. We went through El Bocharón de Padre Abat which is a deep canyon with a river in the bottom and several waterfalls flowing into it. On this trip we stopped in Iquitos where grows the biggest flowered *A. belladonna* with wide petals. It always seems to grow in the open places in full sun. The clumps of bulbs get two feet in diameter and all seem to serve as an ant's nest. The several kinds of ants in Peru teach one great respect. One, the natives call "Isura", makes you sick for two or three days. Another called "Tinga tierra" is given a wide berth by the natives.

On a trip up the Rio Mañan we found another distinct kind of *Eucharis*, small with reflexed petals.

In 1967 I was determined to collect *Amaryllis traubii*. We visited Dr. Ferreyra and obtained exact instructions from him. We took José Gómez Carrión, one of his instructors from the university with us. Upon arrival at Pucayacu (Fig. 10) near Tarapoto, we found that most of the area was under cultivation—tobacco. Travel was difficult because the area is covered with brush about twenty feet high. In the open areas were found *A. belladonna*. After two day search we found only a beautiful rose-colored *A. belladonna* growing in dense shade. We went from here down the Rio Huallaga below Yuramaguas to Shitari in search of *Amaryllis ferreyrae* and *Eucharis ferreyrae*. A search of the islands and shoreline revealed only *Amaryllis belladonna*. We did find three kinds of *Eucharis* and hope that one of them is *Eucharis ferreyrae*.

AMARYLLIS ESCOBARURIAE FROM YUNGAS OF LA PAZ, BOLIVIA

MARTIN CARDENAS, *Cochabamba, Bolivia*

The Province of Sud-Yungas has been indicated as the habitat of several *Amaryllis* species. I have collected there *A. belladonna* L., *A. pardina* Hook f., *A. yungaccnsis* Cardenas & Nelson, *A. forgetii* (Worsley) Traub & Uphof, and now *Amaryllis escobaruriae* Cardenas (Fig. 11).

Fig. 11. **Amaryllis escobaruriae** Cardenas, **sp. nov.**

This species reminds one remotely of the Brasilian *Amaryllis morelia-na* (Lemaire) Traub by its green star in the throat reaching about

to the middle of the petepalsegs. However, *Amaryllis escobaruriae* differs from it by the darker tepalsegs which are acute at both ends and have whitish star bands reaching almost to the tips of the tepalsegs.

This species has been named for the La Paz Burgomaster, General Armando Escobar Uria, who organized this year (1968) the first flower show in La Paz, and brought back from the high mountains of Comanche, Bolivia, at 4,000 m., a whole fruiting specimen of *Puya raymondii* Harms.

Amaryllis escobaruriae Cardenas, **sp. nov.** Fig. 11.

Bulbo globoso 7 cm. diam. Pseudocollo 7 cm. long., 3 cm. crasso. Foliis plusminusve 6 deorsum deflexis, lineari lanceolatis 30—40 cm. long., 3.5 cm. latis a basim angus tatis, connatis vel vaginatis, atro viridis. Scapo 28—30 cm. long., 1.5 cm. a basim crasso. Umbella 2 flora. Bracteis spathaceis acuto lanceolatis 9 cm. long., 0.5 cm. latis, rubis. Pedicellis 5—6 cm. long., diluto viridis. Floribus actinomorphibus 12 cm. long. Ovario 12 mm. long., 5 mm. crasso atro purpureo vel nigrescente. Tubo 1 cm. long. Setepalsegmentis lanceolatis 12x4 cm. a basim atro purpureis, exteriora superne atro rubis, inferne diluto viridis, interiora superne rubis inferne dilutissime viridis, 5 mm. lata balteus albus linea media praeditis. Petepalsegmentis 10x3 cm. lanceolatis, similia coloribus tamquam setepalsegmentis, omnis segmentis ad cuspis acutis, deflexis. Paraperigonium albo viridiscentibus. Staminibus 9 cm. long.; filamentibus albidus. Stylo 10 cm. long., superne albido, inferne purpureo. Stigma trilobata 2 mm. crassa atro purpurea. Capsula trilocularis 18 mm alta, 26 mm. crassa. Semina membranacea, alata, atro brunea 10-15 mm. diam.

Patria: Bolivia. Provincia Sud-Yungas. Departamento La Paz, prope vicinis supra Puente Villa, 1,700 m.

Bulb globose 7 cm. diam., neck 7 cm. long, 3 cm. thick. Leaves about 6 in two distichous sets deflexed laterally, 30—40 cm. long, 3.5 cm. wide at its middle section, narrowed at base, acute at apex, dark green. The basal leaves membranous below, forming a sheath around the upper ones. Scape 28 cm. long, 1.5 cm. thick at base. Umbel 2 flowered. Spathe bracts 9 cm. long, 0.5 cm. wide, acute, red. Pedicels 5—6 cm. long, light green. Flowers fairly regularly actinomorphic. Ovary 12 mm. long, 5 mm. thick, very dark purple to blackish. Tube 1 cm. long. Setelpalsegments lanceolate, acute, 12x4 cm., dark purple like ovary at its base, light green below, dark red above outside; very light green below, red above with a middle whitish 5 mm. wide band inside. Petepalsegments 10x3 cm. of the same color as that of setepalsegments. All segments acute at base and tip, loosely separate and deflexed. Paraperigone very light green as it is at the bottom of the flower inside. Stamens 9 cm. long; filamets whitish. Style 10 cm. long, whitish below, purplish above. Stigma 2 mm. thick, trilobate, dark purple. Capsule when ripe glaucous, trilocular, 18 mm. high, 26 mm. in diam. (It is interesting to note that the capsules of this species, with flowers similar

to those of *A. pseudopardina (A. leopoldii)*, are rather flat as in *A. belladonna* L. and not vertically elongate as in *A. pesudopardina*.) Seeds membranaceous, *unusually small*, 10-15 mm. in diam., dark brown. They suggest those of *A. cybister*.

Bolivia: Province of Sud Yungas. Department of La Paz. Heights of Puente Villa, 1,700 m. July 1967. M. Cárdenas, No. 6296 (Holotype) in Herbarium Cardenasianum.

CRINUM 'QUEEN EMMA' IDENTIFIED

L. S. Hannibal, *Fair Oaks, Calif.*

Several serious attempts to pinpoint the particular type of red-flowered Asian *Crinum* named after the last Queen of the Hawaiian Islands, Queen Emma, became nearly hopeless when we found at least six specific red-flowered forms from Asia growing in the older gardens of Honolulu along with numerous intraspecific hybrids. The Bishop Museum could not clarify the matter; in fact one reference quoted the white flowered *C. asiaticum* since several variants are grown about the islands. Recently Paul Yamanaka had occasion to visit the Queen's summer home at Lawai on the Island of Kauai where her gardens have been kept intact, and found that the "Queen Emma Crinum" there were entirely *C. augustum* in lieu of the anticipated colored Asian Crinum. Proper plantings of *C. augustum* are now being reestablished at the Queen Emma Museum in Honolulu.

All horticultural examples of *C. augustum* observed in Mexico, Florida and Hawaii appear to be identical and completely seed sterile in all locations. There appears to be no record of the species being recollected in the wild. Thus it appears we either have a sterile cultivar or a single hybrid in circulation. This view was also expressed by William Herbert in his treatise of 1837.

AMARYLLID GENERA AND SPECIES

Harold N. Moldenke

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Allium roguense M. E. Peck, Proc. Biol. Soc. Wash. 49: 109. 1936. Bulb almost globose, 10—12 mm. long [says "tall", probably means long], the exterior scales splitting into fibers, the fibers persistent; leaves 2, shorter than the scape, 1 mm. wide; scape 1.5—2 dm. tall, very slender, terete; bract solitary, opened at one side almost to the base or deeply split, long caudate-acuminate; umbel about 10-flowered; pedicels 8—12 mm. long; perianth 1 cm. long, rose, the segments oblong-lanceolate, scarcely acute, becoming involute, saccate at the base; filaments half as long as the perianth; ovary without a plume [or crest].

Pancratium leavenworthii Standl. & Steyerm. in Amer. Midl. Nat. 36: 166. 1946. Bulb ovoid, about 4 cm. long and 2.5 cm. broad, contracted into a short thick neck; leaves long-petioled; membranous in drying, the petiole very slender, to 19 cm. long, scarcely 2 mm. broad near the middle, the blade lanceolate-oblong, 15 cm. long, 3 cm. wide, acute or acuminate at the apex, acuminate at the base but abruptly contracted into the petiole, slightly paler beneath; scape about 30 cm. tall, scarcely 3 mm. thick near the middle, 2-flowered, the flowers sessile; valves of the spathe lanceolate, scarious, 4 cm. long, attenuate, slenderly nerved [=veined]; ovary about 8 mm. long; perianth white, the tube very slender, 7 cm. long, 1.3 cm. broad, slightly widened upwards, the segments linear, equaling the tube, slightly over 1 mm. broad; filaments very slender, shorter than the segments; anthers appendiculate at the apex, the appendiculation curved outwards, 3.5 mm. long; staminal cup narrow, 15 mm. long, 5 mm. wide.

Chlidanthus x *traubii* forma *oblongitepala* Moldk., *forma nov.* A forma typica speciei segmentis tepalorum oblongis ad apicem subrotundis recedit. Typus: No. 1090 (TRA), cult. La Jolla, Calif.

Veltheimia x *traubii* Moldk., *hybr. nov.* Planta hybrida "*V. glauca* Jacq." et "*V. capensis* DC." intermedia; foliis glabris et plantae florescentia praecoci velut in parenta mascula; aliter intermedia. Typus: Traub No. 1085 (TRA), cult. La Jolla, Calif.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., *Emeritus Registrar*

Mr. James E. Mahan, *Registrar*

Mrs. Emma D. Menninger, *Associate Registrar*

This department has been included since 1934 to provide a place for the registration of names of cultivated **Amaryllis** and other amaryllids on an International basis. The procedure is in harmony with the International Code of Botanical Nomenclature (edition publ. 1961) and the International Code of Nomenclature for Cultivated Plants (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "Descriptive Catalog of Hemerocallis Clones, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $5.00 prepaid from: Dr. Thomas W. Whitaker, Executive Secy., The American Plant Life Society, Box 150, La Jolla, Calif. Catalog of Hybrid Nerine Clones, 1882-1958, by Emma D. Menninger; and Catalog of Brunsvigia Cultivars, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of The Genus X Crinodonna was published which serves also as a catalog of cultivars. In Plant Life 1964, the first edition, of "Catalog of Hybrid Amaryllis Cultivars, 1799 to Dec. 31, 1963" was published. Other catalogs of cultivated amaryllids are scheduled for publication in future issues.

The registration activity of the American Plant Life Society was recognized when at the XVIth International Horticultural Congress, Brussels, 1962, the Council of the International Society for Horticultural Science designated the American Plant Life Society as the Official International Registration Authority for the cultivars of **Nerine**; and this was extended

to include all the **Amaryllidaceae** cultivars, excepting **Narcissus** and **Hemerocallis**, at the XVIIth International Horticultural Congress, 1966.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the American Amaryllis Society at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as **Amaryllis**, **Lycoris**, **Brunsvigia**, **Clivia**, **Crinum**, **Hymenocallis**, and so on should be addressed to Mr. James E. Mahan, Registrar, 3028 Palmyra St., New Orleans, Louisiana 70119. The registration fee is $2.00 for each clone to be registered. Make checks payable to American Plant Life Society.

REGISTRATION OF NEW AMARYLLIS CLONES, 1968

Registered by Ludwig & Co., Hillegom, Holland

'Marble Arch' (Lud. 1968) R; A-873; D-4B; U-4 fld.; 26-28″ H; 8″-9″ diam; white with light Dawn Pink (523/2) almost marble colored with whitish apple green throat; spr.

'Moulin Rouge' (Lud. 1968) R; A-874; D-4B; U-4 fld.; 22″-24″ h; 7″-8″ diam.; deep, velvety orange red, lighter towards middle of petals (almost scarlet 19/1) with suggestion of white streak across petals ending in whitish apple green in throat; spr. and win.

'Salmon Tower' (Lud. 1968) R; A-875; D-4A; U-4 fld.; 30″ h.; 9″-10″ diam.; light Mandarin Red (17½) with suggestion of azalea pink towards middle of petals, darker throat; spr. and win.

Registered by Edward C. Prudhomme, Metairie, La.

'Nova' (Prud. 1968) R; A-869; D-4B; U-4 fld.; 24″ h.; 7″-8″ diam.; striped with Jasper red splashes on white base; spr.

'Satellite' (Prud. 1968) R; A-870; D-4B; U-4 fld.; 24″ h.; 8″ diam.; red stripes on a white base with pale apple green throat; spr.

Registered by L. L. Laine, Chalmette, La.

'Red Twist' (Laine 1968) R; A-871; D-6; U-4 fld.; 20″ h.; 5½″ diam.; chrysanthemum crimson (824) with darker veins running through petsegs; spr.

Registered by Albert T. Diermayer, Metairie, La.

'Jules Robert' (Dirm. 1968) R; A-872; D-5A; U-4 fld.; 20″ h.; 6″ diam.; brick red with white ribs in center of segs, blending to green in throat; spr.

HYBRID **NERINE** CLONE

Registered by Hamilton P. Traub, La Jolla, Calif.

'Alma Moldenke', a clone of **Nerine** x **traubianthe** Moldk., named in honor of Mrs. Harold N. Moldenke. Parentage: **Nerine filifolia** Bak. ♀ x **Nerine** clone 'Rosalba' ♂.

Bulb medium sized, producing offsets readily so that a 6-inch pot will soon be filled, the bulbs together producing 10 or more flower scapes in the autumn; propagation may also be by vertical bulb-cuttage (see Plant Life 1968, page 102-103; and Plant Life 1967, [Suppl.] Review of the Genus **Nerine** Herb., page 32). **Leaves** evergreen, several, deep green, linear, canaliculate, to 32 cm. long, to 6 mm. wide, narrowed slightly below, and to bluntly acute above. **Scape** slightly compressed with rounded edges, to 50 cm. long, 4x6 mm. in diam., medium green. **Spathe** 2-valved, green, held horizontally, 5—6.5 cm. long, lanceolate, bluntly acute. **Umbel** to 13—14-flowered; flowers long lasting, held more or less upright, a pleasing medium **Phlox** pink (HCC 625/1). **Pedicels** green, slender, 3-4-5-5.5-6 cm. long. **Ovary**

3 mm. high, 4 mm. in diam., greenish-reddish. **Perigone** zygomorphic, tepalsegs linear, recurved in upper ⅓, 4.2 cm. long, 5 mm. wide, bluntly acute. **Stamens** (and style) fasciculate-declinate-ascending, shorter than the tepalsegs. **Style** trifid, lobes recurved.

ADDITION TO AMARYLLIS SHOW SCHEDULE

Following the groups A, B, and C on pages 46 to 48, 1958 PLANT LIFE, the following artist's group is to be added:

D. ARTIST'S SECTIONS

SECTION XII.—Paintings of Amaryllis and other amaryllids.
SECTION XIII.—Drawings of Amaryllis and other amaryllids.
SECTION XIV.—Sculptures (bas-relief) of Amaryllis and other amaryllids.

AMARYLLID NOTES, 1969

Hamilton P. Traub

Narcissus humile (Cav.) Traub, *comb. nov.* Syn.—*Pancratium humile* Cav. Ic. pl. 4. 1791-1801.

Section *Tapeinanthus* (Herb.) Traub, *sect. nov.*, genus *Narcissua* L. Syn.—*Tapeinanthus* Herb., Amaryll. 190, 414. 1837. Typus: *Narcissus humile* (Cav.) Traub.

Infragenus *Orthogonios* Traub, *infragen. nov.*, Genus *Galanthus* L. (Amaryllidae.) celluluis epidermalibus rectangularibus. Typus: *Galanthus platyphyllus* Traub & Moldenke.

Epidermal cells rectangular.

Brunsvigia x *parkeri* W. Wats. ex Traub, *hybr. nov.* Plantae hybridae inter "Brunsvigia rosea (Lam.) Hann." et "B. major Traub" cum speciebus aliis hujus generis, inter parentes mediae et per procreatio genitura selectiva inter hybridas postea proficientae.

Hybrids of Brunsvigia rosea and B. major with other Brunsvigia species, intermediate between the parents and later improved by selective breeding among the hybrids.

Holonomenifer (typus): No. 823 a+b (TRA), 10-15-60. Paranomenifers: No. 818 a+b (TRA) & No. 816 a+b (TRA), all cult. La Jolla, Calif.

Syn.—"Amaryllis x spofforthiae Herb." Amaryll. [278], 422, 425, 1837, *nomen*; "Amaryllis x parkeri W. Wats.", in Gard. Chron. Feb. 6, 1909, p. 92 et *ibid.* 50(2): 210, fig. 101. 1911; *ibid.* 1(1911) 211; The Garden 75: 462, fig. on p. 460. 1911; Worsley, in Jour. Roy. Hort. Soc. 51: 66. 1926; Hoog. in Herbertia 2: 113-114, pl. on page 113. 1935; "Brunsdonna parkeri alba W. Wats. ex Worsley", in Gard. Chron. Nov. 14. 1925, pp. 391-392, fig. 164; Worsley, in Jour. Roy. Hort. Soc. 51: 64-65; 66, 67. 1926; Gard. Chron. lxxxiv: 331, with illus. 1928; "Brunsdonna sanderae Hort.", Gard. Chron. 50(2): 210. 1911; The Garden 75: 462. 1911; "Brunsdonna tubergenii Hort.", Haggag, in Hort. Rev. Egypt. No. 39, p. 5, with illus. 1918; "Brunsvigia x parkeri (W. Wats.) Traub", in Plant Life 5: 124. 1949; ibid. 16: 58. 1960.

Brunsvigia x *tubergenii* Traub, *hybr. nov.* Plantae inter "*Brunsvigia major* Traub" et "*B. josephinae* (Red.) Ker-Gawl." hybridae et intermediae.

Hybrids of *Brunsvigia major* Traub and *B. josephinae* (Red.) Ker-Gawl.; intermediate between the parents.

Holonomenifer (typus): No. 810 a+b (TRA), 8-27-60, cult. La Jolla, Calif.

NEW MEXICAN ALLIUM SPECIES

Allium huntiae Traub., *sp. nov.*, Plant Life 24: 136-137. 1968, *anglise.* Bulbo ovoideo solitario; foliis 2 linearibus canaliculatis usque ad 4 mm. latis, deorsum vaginatis; umbella laxa 11—18-flora; pedicellis 1.5—2.2 cm. longis; perigonio late campanulato; tepalis 7 mm. longis; staminibus styloque tepalis brevioribus; capsula obscure 6-cristata.

Typus: Howard 67-19B (=no. 1077 TRA), July 22, 1967, west of Durango, Dur. Mex., Highway 40, K. 1016.

Allium mannii Traub & Howard, *sp. nov.*, Plant Life 24: 138. 1968, *anglise.* Bulbo oblongo per fissuras verticales augmenti; foliis 2—4 canaliculatis 3.5—5 mm. latis deorsum vaginatis; umbella 15—25-flora laxa; pedicellis 2.2—2.5 cm. longis; perigonio albo late campanulato, tepalis 10 mm. longis; staminibus styloque tepalis brevioribus; ovario obscure cristato.

Typus: Traub no. 1088 (TRA), grown at La Jolla, Calif., 8-15-68, from bulbs collected by T. M. Howard 67-14, east of Durango City, Mex. Highway 40, roadside, in low wet pastures and ditches in heavy clay soil.

Allium ownbeyi Traub, *sp. nov.*, Plant Life 24: 139, 1958, *anglise*, et Plant Life 25: v. 1969. Bulbo ovoideo per fissuras verticales augmenti; foliis 5 vel 6 late canaliculatis dorsum 6—8-poreatum, poreis marginibusque foliorum minute denticulatis; umbella 7—13-flora; pedicellis 1—1.3 cm. longis; perigonio pallide lavendulo, tepalis patentibus 5—6 mm. longis; staminibus styloque tepalis brebioribus; ovario 6-cristato.

Typus: T. M. Howard, s. n. (= no. 1066 TRA), Nov. 1966, Nuevo Leon, Cerro del Obispado, within western edge of City of Monterrey.

Allium potosiense Traub, *sp. nov.*, Syn.— "Allium subteretefolium Traub" Plant Life 24: 141. 1968, *anglise.* Bulbo ovoideo per bulbas terminales in rhizomatibus horizontalibus augmenti; foliis 3 vel 4 anguste linearibus leviter canaliculatis interdum subteretibus usque ad 3—3.5 mm. latis; umbella 14- vel 15-flora laxa; pedicellis per anthesin 2—2.3 cm. longis; perigonio campanulato; tepalis albidis oblanceolatis 9 mm. longis carinatis, carina brunneo-lavendula; staminibus styloque tepalis parum brevioribus.

Typus: Traub no. 1089 (TRA), grown at La Jolla, Calif., 7-28-68, from bulbs collected by T. M. Howard 66-3A, n. City of San Luis Potosi, Mex.

AMARYLLIS EVANSIAE FORMA VIRESCENS

In February 1968, Mr. Alek Korsakoff sent in a specimen of a form of *Amaryllis evansiae* (Korsakoff No. 1416) with very light uranium

green (HCC 63/3) flowers, and this is here described as a form of this species. Mr. Korsakoff is to be commended on singling out this form of *Amaryllis evansiae*. It is hoped that others will follow up this beginning by gathering together other green-flowered plants of this species. By intercrossing these green-flowered plants it will be possible to establish this trait so that the green-flowered form can be easily increased from seeds.

Amaryllis evansiae forma **virescens** Traub & Korsakoff, **forma nov.**

A forma typica floribus pallidissime uranio-viridibus differt.

Differs from the nomenifer (typical) form in the uranium green flowers. Holonomenifer (typus): Alek Korsakoff No. K 1416 (= No. 1091 TRA), Cult. Jacksonville, Fla., 2-10-68; paranomenifer: Alek Korsakoff No. K 1416A (= No. 1092 TRA), 5-15-68.

Cyrtanthus elatus (Jacq.) Traub, *comb. nov.* Syn.—*Amaryllis elata* Jacq. Hort. Schoen. 1: 32, pl. 62. 1797.

Cyrtanthus purpureus forma *magnificus* (Bak.) Traub, *comb. nov.* Syn.—*Vallota purpurea* var. *magnifica* Bak., Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896.

Cyrtanthus purpureus forma *albus* Bak. ex Traub, *forma nov.* Descr.—Haec forma a forma typica speciei floribus albis recedit (typus). Cf. Bak., Amaryll. 54. 1888; Fl. Cap. 6: 218. 1896.

Subgenus *Vallota* (Herb.) Traub, *comb. nov.* Genus *Cyrtanthus* Ait. Syn.—*Vallota* Herb. App. Bot. Reg. 29. 1821.

Tristagma uniflorum f. *pauciflorum* Traub, *forma nov.*—(descr.) A forma typica speciei umbella 2—3-flora recedit (typus). Cf. Plant Life 23: 67. 1967.

Pancratium landesii Traub, *sp. nov.* (Amaryllidac.).—Foliis oblongis, parte inferiori angustatis; umbella uniflora; segmentis tepalorum linearibus acutis; poculo staminali segmentis tepalorum dimidio breviore. Fig. 14, Plant Life 24: 50. 1968, *typus*. Habitat: On coast near Salahah, Zufur Region, Sultanate of Muscat and Oman.

Tribus *Brodiaeae* Traub, *tribus nov. (Amaryllidac.)* Perigonium regulare, inferne tubulosum, superne in segmentis 6 divisum, rhizoma cormosa pedicelli ad apicem saepe articulati. Typus: Genus *Brodiaea* J. E. Smith

Tribus *Milleae* Traub, *tribus nov. (Amaryllidac.)* Rhizoma cormosa; perigonium regulare; ovarium ad apicem gynophorii positum. Typus: Genus *Milla* Cav.

Subgenus *Oporanthus* (Herb.) Baker ex Traub, *comb. nov.*, "Oporanthus" Baker, in Amaryll. 28. 1888. Syn.—*Oporanthus* Herb. App. Bot. Reg. 38. 1821.

Subgenus *Imatophyllum* (Hook.) Bak. ex Traub, *subg. nov.*, "Subg. Imatophyllum Bak." Amaryll. 61. 1888. Syn.—*Imatophyllum* Hook., Bot. Mag. 2856. 1828.

X *Brunsvine* Traub, in Plant Life 17: 105. 1961, *anglise* et Plant Life 19: 59. 1963; Traub, Genera of Amaryll. 62. 1963. Syn.—

"Nerinodonna Messrs. van Tubergen," Gard. Chron. CLXII: 11. 1967. *anglise;* Amateur Gardening Oct. 28, 1967, p. 47, with figure, *anglise;* Popular Gardening, Oct. 23, 1967, p. 23, with figure, *anglise;* X *Amerine* Sealy, Jour. Roy. Hort. Soc. XCIII(10); 430-433. 1968.

X *Brunserine tubergenii* Traub, in Plant Life 19: 59. 1963. Syn.—"Nerinodonna tubergenii Messrs. van Tubergen", Jour. Roy. Hort. Soc. XCIII(10): 430. 1968, *anglise;* X *Amerine tubergenii* Sealy, Jour. Roy. Hort. Soc. XCIII(10): 430-433. 1968; Beckett, Gard. Chron. Oct. 18, 1968, fig. p. 19.

In connection with X *Brunserine* and X *Brunserine tubergenii* above, it should be noted that *Rhododendron indicum* Sweet (*Ericaceae*) crossed with *R. mucronatum* Don and *R. simsii* Planch. gave rise to most of the group commonly known as the hybrid Indian azaleas. Similarly, in the *Cruciferae*, *Brassica neobrassica* Mill. (Rutabaga) crosses with *B. rapa* (Turnip) with fertile offspring. Such examples can be multiplied almost indefinitely in the Plant Kingdom, including various examples from the *Amaryllidaceae*.

Scientists are agreed that it would be *unrealistic* to separate out *Rhododendron indicum* and *Brassica rapa* as the types of two new genera respectively. Mr. Sealy surely will agree with these conclusions since there are also *no morphological characters of generic importance* to justify separation in each example cited.

In one of the examples from the *Amaryllidaceae*, the Cape Belladonna, *Brunsvigia rosea* (Lam.) Hann. crosses with some other *Brunsvigia* species such as *B. grandiflora* and *B. josephinae* with resulting fertile hybrids such as *B.* x *parkeri* W. Wats, ex Traub (see Traub & Hannibal, Plant Life 16: 39-62. 1960; Traub, Plant Life 25: 63. 1969).

Such hybrids were first made in Australia over a century ago, and more recently in Europe and the United States of America. There are now large populations of these hybrids in various generations from the original crosses, particularly in Australia and California where they are grown outdoors. As was the case with *Rhododendron indicum* and *Brassica rapa* crosses, the Cape Belladonna *cannot* be singled out as the type of a separate *unrealistic* genus as proposed by Sealy (see Jour. Roy. Hort. Soc. XCIII(10): 430-433. 1968) because it crosses with other *Brunsvigia* species with fertile offspring. In addition, the chromosome number as far as known is 2n=22, and there are *no morphological characters of generic importance* to set it apart.

Surely, a scientist of Mr. Sealy's stature will agree with these facts. He apparently has not examined these plants in detail. When he does he will come to the same conclusion reached by other scientists and drop the *unrealistic* proposal to uphold the Cape Belladonna as the type of a separate genus from *Brunsvigia*, and will find it unnecessary to attempt to replace X *Brunserine* Traub (1963) with X *Amerine Sealy* (1968).

LECTONOMENIFER OF **ALLIUM GLANDULOSUM**

Under date of July 1, 1968, Prof. Th. Eckardt, Director, Botanischer Garten & Museum, Berlin-Dahlem, Germany, informed the writer that there is no specimen of *Allium glandulosum* Link & Otto in the herbarium of that institution.

Living stock of *A. glandulosum* was first collected by a Mr. Deppe in Mexico in 1826, near Mexico City, and illustrated by Otto & Link from plants grown at the Berlin-Dahlem Garden (1828-31). It is evident that if a specimen ever existed there, it was apparently lost during the last war. A lectonomenifer (lectotype) is therefore designated below.

Allium glandulosum Link & Otto, Ic. Pl. Rar. Berol. 1: pl. 17. 1828-31; Ownbey, Res. Stud. State Coll. Wash. 15: 224-225. 1947, in part; ibid. 18: 219-220. 1950, in part; Traub, Plant Life 23: 92-94. 1967.

Bulbs grown from stock collected by T. M. Howard (Howard No. 65-80) about 11 Km. (K277) n. of Jacala, Hidalgo, Mexico, July, in leaf, in corn fields, have been maintained at La Jolla, Calif.

For the lectonomenifer, bulbs (offsets from a single bulb) were planted singly in 6-inch pots, 6-24-67 at La Jolla, Calif., and harvested at three developmental stages: (a) 9-15-67 when in full bloom and rhizomes have begun to elongate; (b) when seeds were ripe in November 1967 and the rhizomes had elongated further; and (c) in late January 1968 when growth cycle was completed, as indicated by the death of the original bulb, and the presence of mature flowering-sized terminal bulbs on the rhizomes.

LECTONOMENIFER (lectotype): 1093a (TRA), 9-15-67. PARANOMENIFERS: to show the other two developmental stages. No. 1093b and 1093c (TRA) as indicated above.

SPECIES OF **SPREKELIA**

In the August 1968 (Part 8), Jour. Royal Hort. Soc., p. 335, L. S. Hannibal erroneously equates the dwarf *Sprekelia clintiae* (Plant Life 1965, p. 64) with *S. glauca Lindl.* (Bot. Reg. 26, p. 49. 1840). *Sprekelia clintiae* is quite distinct (as the description shows) from *S. glauca* which is a synonym of *S. formosissima* L.

THE CREST ON THE ALLIUM OVARY AND CAPSULE

Hamilton P. Traub

In connection with the description of Mexican and Central American *Allium* species difficulties were experienced in characterizing the extremities of the ovary and capsule due to the inadequate definition of the term *crest*.

The term *crest* as defined at present in biology, particularly in phytology *(Plantae)* and zoology *(Animalia)*, is very uneven and inadequate.

It is worthwhile to take a glance at the definitions as they appear in a prominent general dictionary, and some dictionaries of biological terms. This will serve as a preliminary to arriving at an adequate definition.

According to Funk & Wagnalls (1930), *crest* is defined as (1) A comb or tuft on the head of a fowl. (2) The projection on top of a helmet; a plume or tuft. (3) A ridge of a wave or of a mountain; the top of anything. (4) A heraldic device; coat of arms. (5) Loftiness; pride; courage. (6) The ridge of the neck of a horse or dog. (7) Architecture: (a) The ridge of a roof. (b) Carved work or any continuous ornament on the ridge or other elevated parts of an edifice; a cresting.

Cooke (1873), dealing with plants and fungi, defined *crest* as "having a ridge or crest".

Gray ex Fernald (1950), dealing with higher plants, defines *crested* as "bearing elevated ridges on projections on the surface, especially on petals, etc."

Featherly (1954) defines *crested* as "with elevated and irregular toothed ridge."

Benson (1957), dealing with higher plants, defines *crested* as "with a crest, that is, a projection at a prominent position such as the apex or midrib of an organ."

Jaeger (1962), dealing with biology in general, mostly zoology, defines *crest* as "the crest of a helmet, the plume; the tuft on the head of animals."

It is readily apparent that the concept of the crest as applied to biology at present is inadequately defined. It is therefore necessary to formulate a comprehensive definition of the term *crest* as it applies to biology as a whole.

The term *crest* as applied in biology refers to the design, ridge, tuft, plume, or any projection at a prominent position on top of any part or organ of an organism (Traub, 1964), including *Acellulare* (viruses), and *Cellulare—Procaryotae* (bacteria and former blue green algae), and *Eucaryotae* (*Plantae*, *Heteroplantae* (fungi) and *Animalia*).

In the *Allium* L. ovary and capsule there are various kinds of crests ranging from designs through tufts, plumes and other kinds of projections. The crests on the ovary are usually not static but are subject to change as the ovary develops into the capsule. In some cases the design or projections on the ovary are barely recognizable, or even unrecognizable, in the mature capsule.

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CHROMOSOME NUMBER IN **LYCORIS "CINNABARINA"**

Nathan William Easterly

During the past year an undergraduate student, Thomas Bryan, and I have worked out the chromosome number of *Lycoris "cinnabarina"*. The growth of the plant is very similar to that of *Lycoris sanguinea*. William L. Hunt (Plant Life, 1963, page 51) refers to it as a variety of *L. sanguinea* and Sam Caldwell, (Plant Life, 1965, page 105), says that the plant may turn out to be *Lycoris kiushina*.

Mr. Bryan took microphotographs (x 1000) of root tip smears. Figures 12-A, 12-B and 12-C are three different shots of the same group of chromosomes. I made xerox copies of the prints, took a small pair of scissors to cut out the individual chromosomes, and lined up the chromosomes as seen in Figure 12-D. Later on, I made smears of two other plants of *Lycoris "cinnabarina"* and made sketches (x 1500) as seen in Figures 12-E and 12-F.

Mr. Bryan found 21 rod-shaped chromosomes and 1 V-shaped chromosome. He also found one B chromosome which would make the chromosome number 2n=22+1B. From the xerox copies I did find the V-shaped one as shown in Figure 12-D. In the lower right corner of Figure 12-C, you will notice the median primary constriction. Another chromosome in Figure 12-C appears to have a median constriction, but these are two chromosomes that are overlapped. 16 of the rod-shaped chromosomes have sub-terminal constrictions.

Note in Figures 12-E and 12-F the chromosome which could be the V-shaped one (arrows) and a smaller fat chromosome (arrows). This smaller chromosome is shown at the lower right of Figure 12-D. I did not find the B chromosome to which Mr. Bryan refers. All 22 chromosomes were bivalent. Some of the sub-terminal constrictions were very clear in the aceto-carmine preparation, others were not.

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SENDING LIVE AMARYLLID FLOWERS BY MAIL

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Difficulty had been experienced in sending specimens of live amaryllid flowers through the mails. Since others may also wish to send live flowers for identification by mail, the following method may be of general interest.

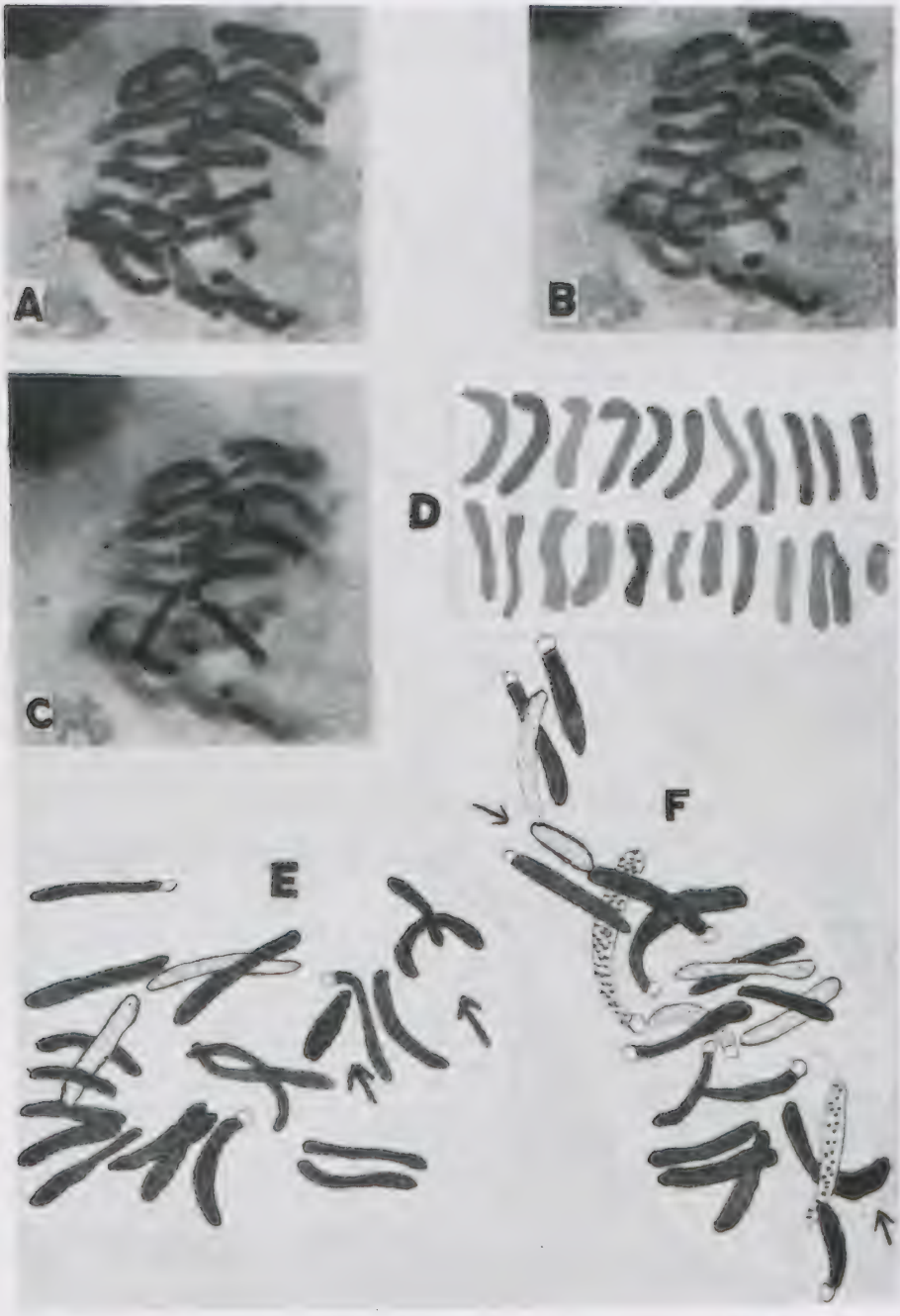

Fig. 12. Chromosomes of **Lycoris** "cinnabaria", 2n = 22, according to Easterly. A, B, C & D, X 1000; E & F, X 1500. For explanation see text.

Formerly specimens were cut just prior to shipment, but mostly the flowers never arrived at their destination in good condition. The new method is as follows: the flower or flowers are cut and placed in a plastic bag *with one end open*, and left for 12 hours in an automatic defrosting refrigerator which gently picks up excess moisture. Thus there is less mushiness on reaching the destination. The usual precautions of wrapping paper table napkins around the bloom before packing in the plastic bag is still followed to help prevent crushing the fragile tepalsegs, and to act as a gentle sponge. Further, it was found that a too small container had been used. The bloom should be left as nearly as possible in the normal shape and with an ample supply of air for the journey. *With the help of air mail*, a bloom of a double *Crinum* (sugnenus *Codonocrinum*) finally reached its journey's end in California with even the perfume intact.

In the October 1959 *Begonian*, the writer saw in the Society's Seedfund column, an offering of seeds of "*Crinum powellii album*". He obtained 5 seeds. All grew and some three years later they reached the flowering stage. As they flowered, it was noted that one plant produced semi- to double-flowered blooms *but only at random*. Having no source books except the copies of PLANT LIFE since 1965, he turned to Dr. Traub for help in checking out the plant, and a judgment about its uniqueness. Finally, the specimen arrived safely to demonstrate that double flowers do occur in *Crinum*. Others may wish to take note of their *Crinum* species and hybrids to study further the occurrence of flower doubling in the genus *Crinum*. Reports by others on double Crinums would be appreciated.

PLANT LIFE LIBRARY—continued from page 4.

WOODLAND NUGGETS OF GOLD, by Val Hardacre. Vantage Press, 120 W. 31st St., New York 1, N. Y. 1968. Pp. i—xii + 304. Illus. $4.95. Subtitled "The Story of American Ginseng Cultivation", this is mainly a rambling autobiographical account of the author's activities as a digger of Ginseng and Goldenseal in the wild, and the cultivation of ginseng. The story "is interwoven with family life and personal experiences. . . . It is a year-to-year account, arranged in chronological order, with allusions to the events taking place that were significant of those times." Cultural details of Ginseng culture are introduced incidentally. In addition he comments on the history of Ginseng and Goldenseal as an article of commerce from colonial times to the present day. Ginseng is a medicinal herb highly prized by the Chinese and other orientals. Two species are involved, **Panax quinquefolius** L. (Araliaceae), American Ginseng, which grows in rich and cool woods, from Que. to Man., s. to n. Fla., Ala., La., and Okla.; and **Panax schinseng** Nees, Asiatic Ginseng, native to Manchuria and Korea. These two species **are not related** to the garden Parsnip, **Pastinaca sativa** L. (Umbelliferae) as indicated in the text. Goldenseal, **Hydrastis canadensis** L. (Ranunculaceae), is native to rich woods from Vt. to Minn. & Nebr., s. to Ga., Ala., Ark. and (formerly) e. Kans. This is the only history of Ginseng and Goldenseal as American crop plants and the book is recommended to all who are interested in economic botany.

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CONTRIBUTIONS TO SOUTH AMERICAN AMARYLLIDACEAE—III.

PEDRO FELIX RAVENNA

I. SYNOPTIC TREATMENT OF THE GENUS **PHAEDRANASSA**

During several searching trips to the Andes, I had the opportunity of collecting a large quantity of bulbous plants. Among them were the species of **Phaedranassa.** One of these was the little known **Ph. dubia** (H.B.K.) Macbr., the other proved to be an undescribed species. The purpose of the present article is to present an up-to-date review of the genus.

Phaedranassa Herb.

Herbert, Edwards' Bot. Reg. 31: misc. p. 16. 1845.—Inflorescence few to many-flowered. Flowers pedicellate horizontal to pendulous, varying from yellowish green, pink, scarlet or red and green, more or less tubular throughout or slightly ampliated at the apex. Hypanthium absent. Tepals narrowly oblanceolate, rather connate at the base. Filaments free, filiform or connate toward the base into a membranous cup (subgenus Stricklandia) attached to the base of the free portion of tepals, filiform, of two or four different lengths. Anthers small oblong-reniform, versatile. Ovary ellipsoid obtusely trigonous; ovules many per cell. Style filiform equaling or surpassing the stamens. Stigma capitate or clavate-capitate. Capsule subglobose; rather tricoccous. Seeds flattened, often D-shaped, black, with membranous edges.

Bulb ovoid produced into a short neck. Leaves petioled, blade lanceolate or elliptic, acute. Scape cylindrical not fistulose. Spathe bivalved; valves marcescent papyraceous; inner bracts as many as the flowers. **Type-species: Ph. cloracra** Herb. = **Ph. dubia** (H.B.K.) Macbr. (Ecuador, Colombia).

Range.—Ecuador and Colombia to Costa Rica. Three species were reported by Macbride to Peru (see notes below).

Species recognized: Ph. carmioli, Ph. dubia, Ph. lehmanni, Ph. loxana, Ph. schyzantha, Ph. tunguraguae, Ph. viridiflora and **Ph. eucrosioides.**

Notes.—Three species were quoted by Macbride (1938) to Peru. With the probable exception of one locality datum, referred by this author to **Ph. viridiflora** ("Huancayo, on the way to the montana", Raimondi), the rest concerning the green-flowered species, must be associated with **Rauhia multiflora** (Kunth) Rav. A dissection of Raimondi's specimen (in SM) shows that this sheet is probably the only one which should be truly referred to the genus; due to its membranous staminal cup it should belong to the subgenus **Stricklandia.** Nevertheless a further study on this specimen is needed in order to identify it correctly.

The report of **Ph. carmioli** from Cusco (Peru) seems doubtful; it probably is a misidentification of some **Eustephia** species.

Systematic position of **Phaedranassa** and its allied genera

Due to the fact that our genus is closely related to **Rauhia,** and has an obvious similarity with **Stenomesson,** it is transferred to the tribe **Stenomesseae.** The scape is solid, and not hollow as was interpreted by Traub (1963). The same position is adopted with **Eucrosia** a genus allied to **Phaedranassa.**

The genus **Chlidanthus** has, in my opinion, a striking resemblance with **Castellanoa,** especially concerning the androecium. Moreover it has 20 somatic chromosomes, a quite unrelated number from those found in **Rauhia** (see Flory 1966) and other genera of the tribe **Stenomesseae.** For these reasons it is placed beside **Castellanoa,** within the tribe **Eustephiae,** as follows:

1a. Flowers red pendulous or sometimes cernuus, slightly zygomorphic ..... **CASTELLANOA**
1b. Flowers yellow, upright to suberect, almost actinomorphic ..... **CHLIDANTHUS**

Tribe **Stenomesseae**

1a. Leaves fleshy, almost coriaceous, folded outwards in outwards in prefoliation ..... **RAUHIA**
1b. Leaves not fleshy, nor almost coriaceous, not folded outwards in prefoliation.
2a. Staminal cup, if present, frequently narrow, more or less hidden by the tepals.
3a. Flowers with a true hypanthium. Staminal cup always present ..... **STENOMESSON**
3b. Flowers lacking a true hypanthium. Filaments free or rarely connate toward the base into a membranous staminal cup.
4a. Stamens moderately surpassing the perigone (not more than half of its length); its filaments straight .... **PHAEDRANASSA**
4b. Stamens twice to five times the length of the perigone; its filaments often declinate-ascending ..... **EUCROSIA**
2b. Staminal cup very large, prominent, not hidden by the tepals. Stamens arising from the inner surface of the staminal cup, some distance below its edge ..... **PARAMONGAIA**

Key to species of **Phaedranassa**

1a. Filaments free.
2a. Flowers red more or less tinged with green.
3a. Flowers green at the apex or, in one case, also at the concrescent part of tepals; the rest red.
4a. Tepals somewhat spreading at their apex. Stamens much surpassing the perigone.
5a. Concrescent portion of tepals green ..... 1. **Ph. loxana**
5b. Concrescent portion of tepals red.
6a. Concrescent part of tepals funnel-shaped. Leaves dark green (at least in the adaxial face), not pruinose, with a short petiole ..... 2. **Ph. carmioli**
6b. Concrescent part of tepals, cup-shaped. Leaves not dark green, pruinose (at least in the wilds); petiole rather long ..... 3. **Ph. dubia**
4b. Tepals straight for all their length. Stamens scarcely surpassing the perigone ..... 4. **Ph. tunguraguae**
3b. Flowers red towards the apex; green only at the concrescent part of tepals.
7a. Flower constricted at the end of the concrescent portion of tepals. Stamens exceeding the tepals for 12-13 mm. ..... 5. **Ph. schizantha**
7b. Stamens exceeding the tepals for 12-13 mm. Flowers constricted at the end of the concrescent portion of tepals ..... 6. **Ph. lehmanni**
2b. Flowers green, passing into whitish and greenish yellow towards the base ..... 7. **Ph. viridiflora**
1b. Filaments connated towards the base into a membranous staminal cup ..... 8. **Ph. eucrosioides**

Subgenus 1. **Phaedranassa**

Filaments free to the base. Staminal cup absent.

1. **Phaedranassa loxana** Rav. **nom. nov.**

Phaedranassa cloracra Lindley, Edwards' Bot. Reg. 31: tab. 16. 1845. Excl. syn. **Ph. cloracra** Herbert, l.c: misc. p. 16. 1845.

Bulb nearly globose or broadly ovoid, about 6-6.5 cm. long, 6.4 cm. wide, with a short neck. Leaves oblanceolate, petioled, probably serotine, about 19 cm. long, 45 mm. broad; petiole relatively long; blade with crossing veinlets in the abaxial face. Scape cylindrical apparently pruinose about 7-8 mm. broad. Inflorescence about 12-flowered. Spathe marcescent papyraceous; inner bracts many narrowly lanceolate. Flowers nodding about 58-59 mm. long, 31-32 mm. in diameter at the apex, slightly constricted at the end of the concrescent portion of the tepals, which is green. Tepals oblanceolate about 44-52 mm. long, 75-95 mm. broad; a rose-red for 30-35 mm., upper third greenish with yellowish margins. Filaments biseriate, [the epipetal slightly longer, about 57-60 mm. long]; anthers reniform-oblong, yellow about 5-6 mm. long. Ovary obovoid or ellipsoid obtuse-trigonous, green. Style equaling the stamens or apparently slightly shorter; stigma capitate.

Hab.—Ecuador, region of Loja.

Phycella cloracra Herb. was a superfluous additional name for **Haemanthus dubius** H.B.K. (known at present as **Phaedranassa dubia**). Herbert includes **H. dubius** under synonymy of his species quoting the same locality data mentioned by Humboldt, Bonpland and Kunth. This fact obviously proves that **Phycella cloracra** was correctly referred by authors to **H. dubius** H.B.K. Furthermore when Herbert established **Phaedranassa** (Bot. Reg. 31: misc. p. 16, 1845), he repeats for **Ph. cloracra** (the type species) the synonymy and place of origin as under **Phycella cloracra** Herb. Thus, both names must be associated to the same plant.

In the same volume (under plate 17), Lindley reproduces Herbert's Latin descriptions for the name **Phaedranassa cloracra.** Unfortunately he gives the illustration of a related, but different species. This was found also in Ecuador, near Saraguro, a small town which belongs to the southernmost province of Loja. Actually, Lindley himself was approaching to the truth, when he stated: "Another species of **Phaedranassa** is the **Phycella obtusa** mentioned in the last volume of this work at no. 93 of the miscellaneous matter. It was also one of the discoveries of Mr. Hartweg, who collected it on the arid banks of the river Guallabamba, in the valley of San Antonio, in the province of Quito, at an elevation of about 7000 feet above the level of the sea. As this was the place where Humboldt and Bonpland found their **Haemanthus dubius**, it is not improbably that it is of **P. obtusa** rather than **cloracra** that this plant is a synonym". **Phycella obtusa** Herb. represents a further synonym for **Phaedranassa dubia** (H.B.K.) Macbr.

A question then arises: should we have considered Lindley's plant as a validly published species? The alternative lies in the fact that the new combination **Phaedranassa cloracra** (Herb.) Herb. and **Ph. cloracra** in the sense of Lindley, appeared in the same volume. We could have selected Lindley's article against Herbert's. By this way, the binomial **Ph. cloracra** should have been preserved for Lindley's plant, as published by this author. This statement however, even if possible, would not have helped in clearing up of our knowledge of the genus; moreover, much confusion would be added. It seemed better to accept **Ph. cloracra** (Herb.) Herb., as a validly published combination, even if it would be kept under synonymy of **Phaedranassa dubia** (H.B.K.) Macbr. Thus, a new name for Lindley's plant is necessary.

Having had the opportunity of seeing in the wilds a large number of plants of **Ph. dubia**, no doubts exist in my mind that **Ph. loxana** represents a distinct species.

2. **Phaedranassa carmioli** Bak.

Baker, Saunders' Ref. Bot. 1: tab. 46. 1869.

A native of Costa Rica where it was recently recollected (see Herbertia 1940). The leaves are very similar to those of **Ph. tunguraguae** Rav.

3. **Phaedranassa dubia** (H.B.K.) Macbr.

Macbride, Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 11: 12. 1931; **Haemanthus dubius** H.B.K., Nov. Gen. Sp. Pl. 1: 281. 1816; **Crinum quitense** Sprengel, Linn. Syst. Veg. 2: 55. 1825; **Collania dubia** (H.B.K.) Roemer et Schultes, Linn. Syst. Veg. 7(2): LII. 1830; **Phycella obtusa** Herbert, Edwards' Bot. Reg. 30: misc. p. 93. 1844; **Phaedranassa cloracra** Herbert, Edwards' Bot. Reg. 31: misc. p. 16. 1845; **Ph. obtusa** (Herb.) Lindley, **loc. cit.** 31: sub tab. 17. 1845.

Plant about 40 cm. high. Bulb widely ovoid covered with brownish, more or less corrugated coats, these are often produced upwards in a somewhat long pseudoneck (at least in the wild); roots somewhat fleshy. Leaves none at flowering time, [hysteranthous], sometimes decumbent, distinctly petioled, about 30-40 cm. long, 50-65 mm. broad; petiole about 7-10 cm. long; blade oblanceolate, revolute in vernation, often pruinose in the adaxial face, paler and with a thick midrib in the abaxial face. Scape cylindrical, not fistulose, pruinose, about 40 cm. long, 7.5 mm. broad. Spathe 4-6-flowered, bivalved; valves lanceolate, subequal, at anthesis papyraceous; inner bracts linear. Flowers pendulous, about 50 mm. long, 18 mm. in diameter or sometimes less at the apex, bright red from the base to 33 mm., green or greenish upwards. Pedicels cylindrical about 15-20 cm. long. Tepals narrowly oblanceolate, concrescent for nearly 10 mm., permanently imbricate-contiguous for more than three quarters of their length, then somewhat spreading, the green portion paler at the margins; the outer about 42-43 mm. long, 7 mm. broad, the inner slightly shorter and broader, about 38 mm. long, 7.5 mm. broad. Filaments somewhat complanate especially downwards, 4-seriate, pinkish, the lower pair about 4.45 mm. long, intermediate single about 45 mm. long, next pair nearly 47 mm. long, the lower single about 49 mm. long. Anthers yellow, nearly reniform, versatile, about 3 mm. long. Ovary declined, ellipsoid, tricostate, green, about 8.2 mm. long, 3.8 mm. wide. Capsule subglobose, somewhat tricoccous. Seeds flattened, black, D-shaped, with membranous edges.

Hab.—Frequent from Quito province in Ecuador, to Pasto (Colombia). It grows often on slopes in a well drained soil. I have found it, sometimes associated with **Ennealophus** sp. (**Iridaceae**), **Stenomesson aurantiacum** (H.B.K.) Herb., **Salvia** sp., **Erica** sp., and several small bushes.

Phaedranassa tunguraguae Rav., **sp. nov.** (Fig. 13)

Planta usque 64 cm. alta. Bulbus late ovatus ad 5.5-7 cm. longus circ. 4.5-5.8 cm. latus tunicis exterioribus fusco-ochraceis in collo perbrevi circ. 2.5 cm. longus productis. Folia usque tres autumnali-vernalia prefoliationis revoluta ad anthesin absens petiolata ad 29-40 cm. longa circ. 53-80 mm. vel ultra lata; lamina fusco-viridia subnitida lanceolata vel ob lanceolata; petiolus ad 6-9 cm. longus. Scapus teres efistulosus usque 54 cm. longus, prope basin usque 12.3 mm. latus, ad apicem circ. 6.8 mm. latus, pruinosus. Spatha 6-8-flora vivalvata, valvae valde inaequales circ. 3.8-4.2 mm. longae marcescentes papyraceae ad anthesin reflexae; bracteae interiores plures angustissime lanceolatae vel sublineares. Pedicelli ad 12-40 mm. longi. Flores declinati haud penduli ad 4 cm. longi ad basin veram viridi deinde circ. 26 mm. rubro-corallini, ad apicem viridi. Tepala anguste oblanceolata ad basin circ. 3.5 mm. connata subrecta inter se imbricato-con-

Fig. 13. **Phaedranassa tunguraguae** Rav., **sp. nov.**, native to Ecuador. Photo by P. F. Ravenna.

tigua ad 32 mm. longa circ. 4 mm. lata, exteriora perbreviter apiculata, interiora leviter minora acuta. Filamenta ad basin partii libera tepalorum insaet filiformia alba stricte fasciculata tepalas breviter superantia, 4-seriata Antherae aellypticae ad 1.8-1.9 mm. longae, pollen luteus. Ovarium subaellypticum obtuse triqetrum pruinosus ad 6 mm. longum circ. 3 mm. latum. Stylus filiformis ad 38-43 mm. longus; stigma capitatus. Capsula matura seminaque non vidi.

Hab.—In decliviis abruptis supra fluminem Pastaza prope Baños (locis Spruceanis) prov. Tunguraguae Equatorii. Crescit prope **Anthericum glaucum** Ruiz et Pav., **Ennealophus** sp. **(Iridaceae)**, **Coursetia** cfr. **fruticosa** (Cav.) Macbr. **(Leguminosae)**, **Vicia** cfr. **andicola** Kth. (Ley.) Bromeliaceae et caet. Culte in horto meo.

Plant about 54 cm. high. Bulb widely ovate about 5.5 cm. long, 4.5-5, 8 cm. wide; outer coats brownish produced into a very short (about 2.5 cm. long) pseudoneck. Leaves not more than three, from autumn to the beginning of spring, revolute in vernation, not developed at the flowering time, petioled, about 29-40 cm. long, 53-80 mm. broad; petiole about 6-9 cm. long; blade lanceolate or oblanceolate, dark green, slightly shining, paler on the abaxial face. Scape cylindrical, solid, about 54 cm. long, 10-12, 3 mm. wide near the base, 6 mm. near the apex, pruinose. Spathe bivalved 6-8-flowers; valves marcescent, papyraceous at anthesis; inner bracts several, very narrowly lanceolate to nearly linear. Pedicels about 12-40 mm. long. Flowers declined, not nodding, about 4 mm. long, green in the very base, coral-red for 26 mm., green toward the apex. Tepals narrowly oblanceolate, about 32 mm. long, 4 mm. broad, connate at the base for 3.5 mm., nearly straight, imbricate-contiguous for 23 mm., outer shortly apiculate, inner slightly shorter, acute. Filaments attached to the base of the free portion of the tepals, filiform, white, closely fasciculate, of four different lengths, somewhat longer than the tepals. Anthers elliptical about 1.8-1, 9 mm. long; pollen yellow. Ovary nearly elliptical obtusely trigonous, about 6 mm. long, 3 mm. wide. Style filiform about 38-43 mm. long; stigma capitae. Mature capsule and seeds not seen.

Hab.—In rugged slopes above the river Pastaza, near Baños, prov. of Tunguragua, Ecuador. It grows near **Anthericum glaucum** Ruiz & Pav., **Ennealophus** sp. **(Iridaceae)**, **Coursetia** cfr. **fruticosa** (Cav.) Macbr., (Leguminoses), **Vicia** cfr. **andicola** Kth. (Legum.), Bromoliads and others. Cultivated in my collection at Buenos Aires.

Specimens.—Cultivated at Buenos Aires from bulbs collected in the above mentioned region; leg. Ravenna 373, nov. 1965. (type in Herb. Ravennae).

This species seems to be an endemic of the Baños region, in Ecuador. It was found by me, in the vegetative state, in the same places which were intensively explored by R. Spruce during 1857. Our plant is quite rare and it grows practically concealed by bushes. Thus it is not surprising that the famous English botanist had not found it.

The bulbs were introduced to my collection of living plants. One of them flowered for the first time in 1965. In the following years I have seen flowers twice. The plants seem to be well established in pots. They have to be kept nearly dry when they give flowers and have no leaves.

5. **Phaedranassa schyzantha** Bak.

Baker, Gard. Chron. n. ser., 14 (2) : 556. 1880

The flowers of this species were described by Baker (1888) as: "Perianth limb 1½ in. long; tube campanulate green 1/6 in. long; segments lanceolate, bright red, with a salmon coloured obtuse tip ¼ in. broad.

Hab.—Andes of Colombia ("Ecuador" according to Baker), Pasto, about 3200 m. Discovered by André in 1876.

6. **Phaedranassa lehmanni** Reg.

Regel. Gartenfl. 32: 354, tab. 1138. 1883.

Possibly not specifically distinct from **Ph. schyzantha.** The only character which doubtfully separates both taxa is the length of stamens and style. The geographical range of both seems to be practically coincident or at least not very distinct.

Hab.—Columbia, western slopes of the Andes, at an elevation of about 2200 m. Introduced by Lehmann.

7. **Phaedranassa viridiflora** Bak.

Baker, Gard. Chron. n. ser. 8(2): 134. 1877.

According to Baker this could be a colour-variety of **Ph. dubia.** In my opinion it seems to be a good species.

Hab.—Andes of Ecuador. Described from living specimens sent by Mr. H. J. Elwes in June 1877, and Mr. Wilson Saunders.

Subgenus 2. **Stricklandia** (Bak.) Rav. **comb. nov.**

Genus **Stricklandia** Baker, Handb. Amaryll.: 105. 1888.

Filaments united in the lower half forming a staminal cup.
Type-species: Ph. eucrosioides (Bak.) Rav.

8. **Phaedranassa eucrosioides** (Bak.) Benth. & Hook.

Gen. Pl. 3(2): 733. 1833; **Stricklandia eucrosioides** (Herb.) Bak. Amaryll. 105. 1888; **Leperiza eucrosioides** Bak., Gard. Chron. 1(1878) 170; **Stenomesson stricklandii** Bak. loc. cit. 2 (1882) 102.

It does not seem necessary to repeat here Baker's description. According to this author, **Stricklandia** differs from Phaedranassa merely in its filaments united into a staminal cup in the lower half. Excepting this character, it is similar in every respect to the latter genus. Therefore I have reduced it to subgeneric rank. Apparently there exists a second species of this subgenus in Peru.

Excluded or doubtful species

Rauhia multiflora (Kth.) Rav., **comb. nov.**

Phaedranassa multiflora Kunth, Enum. Pl. 5: 502. 1850; **Ph. megistophylla** Kraenzlin, Engler Bot. Jahrb. 54, Beibl. 17: 2. 1916; **Rauhia peruviana** Traub, Pl. Life 13: 73. 1957; **Rauhia megistophylla** (Kraenzl.) Traub, Pl. Life 22: 5. 1966; Ravenna, Sellowia 19: 33. 1967.

In the first series of these notes (Ravenna, 1967), **Phaedranassa megistophylla** Kraenzl. was recognized as belonging to the genus **Rauhia.** Consequently, the combination **Rauhia megistophylla** (syn. **R. peruviana** Traub) was made. The same conclusion was reached by Traub a year before (see Traub 1966), but due to an oversight, his article was not detected.

Recently however, **Ph. multiflora** Kth. a much earlier binominal was found for the same species. The geographic range given by Kunth was "Colasey, Prov. Jaen de Bracamoros". No further reports of country as to habitat were quoted. In spite of this omission, the place was detected by me as belonging to Peru. Therefore, the complete data for the species must be: Peru, Dept. Cajamarca, prov. de Jaén (or "J. de Bracamoros"), Colasay (not "Colasey"). As can be seen, it belongs to the very same region where the other populations were found. Vernacular names are: "puccra" and "oreja de burro". Chromosomes: $2n = 46$ (Flory, W. S. Plant Life 22: 52-55. 1966).

"? Phaedranassa vitellina Roezl. ex Wallace" **nomen subnudum.**

Wallace, Gard. Chron. ser. III, 83: 47. 1928. The author of this provisional name, and therefore illegitimate, writes as following: "A new species, probably a **Stenomesson,** described [verbally] as having brilliant orange-scarlet flowers". Collected in Ecuador, this should be associated with **Stenomesson aurantiacum** (H.B.K.) Herb.

"? Phaedranassa ventricosa Roezl. ex Wallace", **nomen subnudum.**

Wallace, loc. cit.: 47. 1928. Concerning this plant, its author says: "has a fine head of bright scarlet flowers very ventricose, with yellow protrudin antlers". Probably it should be referred to **Urceolina** peruviana, or to some allied species. It was found in Peru.

Phaedranassa rubroviridis Bak.

Baker, Gard. Chron. n. ser. 4(2): 7. 1875.

According to Baker (1888), this a synonym of **Eustephia coccinea** Cav.

II. STUDIES IN THE GENUS **GRIFFINIA**

During several collecting trips in Brazil, some species of this genus were found. They were cultivated in Buenos Aires, and their characters were studied and compared with those in other genera.

From a number of seven species gathered, three proved to be new to science, but only two flowered so as to permit descriptions and photographs. The third, a very rare native of southern Maranhao, was lost without flowering.

Invalidity of the genus **Hyline**

The genus **Hyline** was founded by Herbert (1841) who based it on a single species: **Hyline gardneriana** Herb.; this one automatically became the type.

It is of importance to repeat here Herbert's description of the androecium: **"filamenta cum stylo tenuia".** Nothing was said about a staminal cup. Moreover, in a foonote he states: **"Genus a Crino affine".** These points were confirmed by me on living plants recently collected, which were identified by comparison with a photograph of the type-specimen (at Kew). The latter consists of a single scape with flowers and two leaves. Therefore it is difficult to understand how Baker (1888) could have misinterpreted the nature of the androecium, describing it as "filaments very long united in a short cup at the base". Possibly he was influenced by the long narrow tepals, which resemble those of the **Hymenocallis** species.

On the other hand, on Gardner's label of collection is written: "These two withered specimens are all that I have been able to find. The flowers are white and must be very large. I sent plenty of bulbs to Mr. Murray. The bulb is used here as an emetico-purgative medicine in pectoral complaints". In the first line he was evidently referring to the poor and rather squashed specimen. This circumstance is excusable if we consider that the flowers expand late in the evening and last only one night. The flowers were surely decayed when the scape was taken probably in the morning.

Fifty eight years later, and as a consequence of Baker's mistake, the species was redescribed as **Hyline worsleyi** Mallet. Its author says: "The general aspect of the flower is that of **Griffinia**". In fact his opinion was correct, nevertheless in the 1936 edition of Herbertia, Worsley claims against Mallet's remark: "This cannot be substantiated", he says. Worsley was evidently following Baker in considering our plant as belonging to a genus related to **Hymenocallis**, a statement which as we have seen, is not accepted here.

Actually, the flower shows such characters as to justify a subgenus within the genus **Griffinia:**

Subgenus **Hyline** (Herb.) Rav. **comb. nov.** (within the genus **Griffinia** Ker-Gawl.); Genus **Hyline** Herbert, Curtis' Bot. Mag. 66: sub tab. 3779. 1841. **Type-species: Griffinia gardneriana** (Herb.) Rav.

Differs from subgenus **Griffinia,** by having nocturnal flowers, with long narrow tepals, all six stamens closely fascicled, declined, and many ovules per cell in the ovary.

Two species from Brazil: **G. gardneriana** (Herb.) Rav., a native of the States of Ceará, Pernambuco and Piauí, and **G. nocturna** Rav. from southern Goiás.

1a. Hypanthium absent or obsolete. Leaves nearly sessile or very shortly petioled, lorate or narrowly oblanceolate, nearly flat, closely prostrate on the ground (at least in the wilds) .....**C. gardneriana**

1b. Hypanthium well developed. Leaves petioled, broadly oblanceolate, rather canaliculate, not prostrate .....**G. nocturna**

Griffinia gardneriana (Herb.) Rav., **comb. nov.; Hyline gardneriana** Herbert, Curtis' Bot. Mag. 66: sub tab. 3779. 1841: **Hyline worsleyi** Mallet, Gard. Chron. ser. III, 26: 102. 1899.

Plant about 30-47 cm. high. Bulb widely ovate, about 45-70 mm. wide, covered with whitish or pale ochraceous coats; the pseudoneck always present, elongated, to 15 cm. long. Leaves lorate to oblanceolate, sessile or with a short petiole, always prostrate in nature, about 12-48 cm. long, 25-45 mm. broad, often with grayish areas in the adaxial face. Scape edged, about 20-36 cm. long. Spathe 2-3-flowered, bivalved; valves membranaceous, free down to the base. Pedicels about 19-32 mm. long. Flowers white, nocturnal, scented, about 12-15 cm. in diameter. Tepals linear-oblanceolate, subequal, about 15-18 cm. long, 13-16 mm. broad, the outer lateral and inner ones recurved. Stamens long, declined, all six fascicled, its filaments of four different lengths. Anthers linear-oblong, versatile, yellow, about 6-10 mm. long. Style white, about 15.7 cm. long; stigma punctate. Chromosomes: 2n = 20 (Mookerjea, 1955) see Traub (1963).

Hab.—It grows in sandy soil under deciduous woods. Quite common in the "caatingas" of southern Ceará, Piauí and southwestern Pernambuco. The bulb is used by natives as hemetico-purgative. Vernacular name: "cebola braba".

Specimens.—Brazil, Ceará, dry woods; leg. Gardner 1854, oct. 1838 (phototype from K).

Griffinia nocturna Rav., **sp. nov.** (Figs. 14 and 15)

Planta circ. 35 cm. alta. Bulbus ovato-globosus vel deppresso-globosus usque 7 cm. latus in collo productus, tunicis exterioribus albiusculis vel ochraceis vestitus. Folio usque quinque oblanceolata, valde petiolata longitudinaliter canaliculata ad margines revoluta usque 40-50 cm. longa circ. 7 cm. lata. Scapus 14-35 cm. longus circ. 10-12 cm. latus compressus. Spatha bivalvata 3-4-flora; valvae albiusculae vel viridiscentes lanceolatae ad apicem attenuatae valde carinatae et translucidae ad 50-66 mm. longae; bracteae interiores 2-3 anguste lanceolatae. Flores cernui albi ad 11-15 cm. longi horizontaliter usque 11 cm. latus, verticaliter circ. 10 cm. latus. Pedicelli crassi ad 3 cm. longi circ. 5.5 cm. lati vel nulli. Hypanthium subbrectus vel valde curvatus viridescens circ. 50 mm. longum. Tepala angustissima lineari-oblanceolata, exteriora ad 9 cm. longa usque 13 mm. lata, ad margines valde undulata, ad carinam viridescentia, apicem versus arcte recurvata (praecipue superius) apiculata (apiculus arc 4.7 mm. longus), interiori-lateralia ad 8.7 cm. longus circ. 10-12 mm. lata acuta valde recurvata. Filamenta alba fasciculato-declinata, sepalinum superiore ad 83 mm. longum, sepalina colateralia ad 88 mm. longa, petalinum inferiore circ. 72 mm. longum, petalina colateralia circ. 75. Anterae versatiles oblongo-lineares leviter arquatae ad 7.7 mm. longae; pollen luteus. Ovarium aellypticum obtuso-triquetrum pallide viride ovula biseriata 10-12 per loculum ad 8-12 mm. longum circ. 6.7-8.5 mm. latum. Stylus albus declinato-ascendens ad 15 cm. longus; stigma punctato-capitatus.

Hab.—In nemoribus hemideciduis vel deciduis collibusque prope urbem Goias, civit Goiás Brasiliae. Crescit prope **Trimezia lutea** (Kl.) R. C. Fost., ssp., **Alstroemeria** sp. **Aristolochia** sp. (suffrutex erectus floribus luteis concoloribus instructus), Commelinaceae, Euphorbiaceae urticantes, raro pr. **Bomarea** sp.

Plant about 35 cm. high. Bulb ovoid-globose or globose-depressed to 7 cm. wide, produced upward into a pseudo-neck; outer coats whitish or ochraceous. Leaves about five, oblanceolate, distinctly petiolate, chanelled, with slightly revolute margins, about 40-50 cm. long, 7 cm. wide. Scape compressed about 14-35 cm. long, 10-12 mm. broad. Spathe bivalved 3-4

Fig. 14. **Griffinia nocturna** Rav., **sp. nov.**, native to Goiás, Brasil. Inflorescence. Photo by S. Magno.

flowered; valves whitish or greenish lancelate, attenuate towards the apex, rather carinate, hyaline about 50-66 mm. long; inner bracts 2-3 narrowly, lanceolate. Flowers cernuus white, nocturnal, scented, about 11-15 cm. long, 11 cm. in its horizontal diameter, 10 cm. in its vertical diameter. Pedicels thick, about 3 mm. long and 5.5 cm. broad, or obsolete. Hypanthium nearly straight or rather curved, greenish, about 50 mm. long. Tepals very narrow linear-oblanceolate, the outer 9 cm. long, 13 mm. broad, with rather undulate margins and a greenish-cream, markedly recurvate towards the apex (especially the upper), apiculate (apiculus about 4.7 mm. long), innerlateral about 8.7 cm. long, 10-12 mm. broad, acute, rather recurvate. Filaments white, declined, fascicled, the upper episepal about 83 mm. long, both lateral episepals about 88 mm. long, lower epipetal about 72 mm. long; both

Fig. 15. **Griffinia nocturna** Kav., **sp. nov.**, native to Goiás, Brasil. Flower, front view (left) and side view (right). Photos by S. Magno.

lateral epipetals about 75 mm. Anthers versatile, linear-oblong slightly curved, about 7.7 mm. long; pollen yellow. Ovary ellipsoid obtusely trigonous, pale green, about 8-12 mm. long; 6.7-8.5 mm. wide; ovules biseriate, 10-12 per cell. Style declinate-ascending, about 15 cm. long. Stigma punctate-capitate.

Hab.—Deciduous or semideciduous woodland on hills, near the town of Goiás in the State of Goiás, Brazil. It grows near **Trimezia lutea** (Kl.) Fost. ssp., **Alstroemeria** sp, **Aristolochia** sp. (a small shrub with yellowish unspotted flowers), Commelinaceae, Euphorbiaceae, rarely also near **Bomarea** sp.

Specimens.—Cultivated in Buenos Aires from a bulb collected in the above mentioned region; leg. Ravenna 531, April 1966 (type in Herb. Ravennae).

Fig. 16. **Griffinia espiritensis** Rav., sp. nov., native to Espirito Santo, Brasil. Inflorescences. Photo by P. F. Ravenna.

Bulbs of this handsome species were gathered by me in Goiás during the summer of 1966; at that time no flowers were found. Bulbs were carried to Buenos Aires and introduced to my collection. One plant flowered nearly one month later, a second which served for photographs, in the next spring. The scented flowers open at half past seven and they decay early the next morning, as follows: the first two or three simultaneously, the latter about two days later.

The small town of Goiás, the old capital of the State, was an obvious center for botanists of the last century, as Gardner, Saint Hilaire, Glaziou, and others which were going to collect in central Brazil. Therefore, it seems to me unexplicable, how they could have missed our plant, which is abundant a half kilometer or less, from the center of the town. Even if not in flower, bulbs should have been sent, with many others, to Europe for cultivation.

Crinum stapfianum Kraenzl. also a native of the State of Goiás, differs from our species by its long pedicels (to 6 cm.). Apparently, it was correctly classified in that genus.

A new species of the subgenus **Griffinia**

Griffinia espiritensis Rav., **sp. nov.** (Figs. 16 and 17)

Bulbus subglobosus circ. 5 cm. vel infra latus extus albiusculus vel pallide ochraceus in collo productus. Folia longe petiolata (petiolus erectus circ. 15-20 cm. longus); lamina subaelyptica vel late lanceolata subpatentia, acuta fusco-viridia, interdum obscure maculata sf 12-15 cm. longa circ. 7-8 cm. lata. Scapus teres sed leviter bimarginatus, ochraceo-rubellus, ad 25-75 mm. longus circ. 4.5 mm. latus. Spatha bivalvata 5-6-flora, valvae late lanceolatae basin versus connatae membranaceae translucidae integrae ad 16-22 mm. longae circ. 6-9 mm. latae. Flores pedicellati albiusculi et pallide lilacini ad 3.1 cm. longi horizontaliter circ. 3 an lati verticaliter circ. 3.2 cm. lati. Pedicelli pallide virides tereti ad 10.5 mm. longi. Tepara ad basin circ. 2.3 mm. concrescentia anguste oblanceolata, exteriori-lateralia paullo arquata ad 3.15 cm. long circ. 5 mm. lata apiculata (apiculus circ. 25 mm. long), exteriori-superius ad 3.3 cm. longum circ. 6.3 mm. lata apiculatum; ad basin apiculi minute tuberculata; interiori-lateralia ad exteriori-superius approximata usque 2.95 cm. longa circ. 6.4 mm. lata, leviter arquata, interiori-inferius declinato-horizontale ad 3 cm. longum circ. 4.2-5.4 mm. lata. Stamina fertilia sex; filamenta albiuscula, sepalinum-superius ad tepalum exteriori-superius approximatum circ. 23 mm. longum, caetera declinata, sepalina lateralia ad 24.5 mm. longa, petalina lateralia ad 19 mm. longa, petalinum-inferius circ. 18 mm. long. Antherae oblongo-reniformes ad 1.9-2.4 mm. longae, pollen cinereo-ochraceus.

Hab.—In sylvis civitatii Espiritu-Santo Brasiliae.

Bulb subglobose about 5 cm. or less wide, whitish or slightly ochraceous, produced into a pseudoneck. Leaves long petioled (petiole erect about 15-20 cm. long); blade nearly spreding, elliptical or broadly lanceolate acute, dark green sometimes obscurely maculated about 12-15 cm. long, 7-8 cm. broad. Scape cylindrical but with two slight margins, ochraceous to rufescent, about 25-75 mm. long, 4.5 mm. broad. Spathe bivalved 5-6-flowered; valves broadly lanceolate connate toward the base, membranous, somewhat hyaline, entire, about 16-22 mm. long, 6-9 mm. broad. Flowers pedicellated whitish and of a pale lilac about 3.1 cm. long, 3 cm. in its horizontal diameter, 3.2 cm. in its vertical diameter. Pedicels of a pale green, cylindrical, about 10.5 mm. long. Tepals connate for 2.3 mm. narrowly oblanceolate, outer-lateral somewhat arched about 3.15 cm. long, 5 mm. broad, apiculate (apiculus about 2.5 mm. long), the upper outer about 3.3 cm. long, 63 mm. broad also apiculate, at the base of the apiculus with a minute tubercle; both inner lateral approximate to the upper outer tepal, about 2.95 cm. long, 6.4 mm. broad, slightly arched, the lower inner declined to horizontal about 3 cm. long, 4.2-5.4 mm. wide. Stamens six all fertile; filaments whitish, the upper episepal approaching to the upper outer tepal about 23 mm. long, the rest declined, the lateral episepal about 24.5 mm. long, lateral epipetal about 19 mm. long, lower epipetal about 18 mm. long. Anthers reniform-oblong about 1.9-2.4 mm. long; pollen of a grayish-ochre colour.

Hab.—In woods of the State of Espiritu Santo, Brazil. It grows near **Neomarica** sp. (Iridaceae) and various Commelinaceae and Marantaceae.

Specimens: Cultivated in Buenos Aires from bulbs collected near the Sooretama Biological Reserve, on the way to the water-fall, State of Espiritu Santo, Brazil, leg. Ravenna 399, dec. 1965 (type in Herb. Ravennae). Brazil, Espiritu Santo, mun. Nova Venecia, Serra de Cima; leg. A. P. Duarte 3621, & J. C. Gomes 435, 16-XI-1953 (RB).

This very interesting species has the longest petioles in the genus. The shape of the flowers much resemble those of **G. rochae**, which bear only five stamens. It is somewhat related also to **G. ornata** T. Moore. This one however is a much more robust plant with shorter petioles and longer oblanceolate blades.

Fig. 17. **Griffinia espiritensis** Rav., Sp. Nov., native to Espirito Santo, Brasil. Details of flower, **upper,** side view; **lower,** front view. Photos by P. F. Ravenna.

III. **AMARYLLIS** NOTES

Some new species from Brazil are reported here. Additional miscellaneous notes are also included.

Amaryllis monantha Rav., **sp. nov.** (subgenus **Amaryllis**)

Planta usque 34 cm. alta. Bulbus parvus subglobosus saepe prolificus usque 38 mm. latus in collo perbrevi productus. Folia ad anthesin nulla serotina modice firma haud flaccida, glaucescentia canaliculata usque 15 cm. longa vel infra, circ. 2.5-3 cm. lata. Scapus teres ad 20-40 cm. longus usque 8 mm. latus. Spatha semper uniflora bivalvata; valvae lanceolatae rufescentes circ. 31-60 mm. longae; bractea interior unica lineari-acuta circ. 11-20 mm. longa. Flos declinatus scarlatinus ad 7-11 cm. longus circ. 9-10 cm. latus perapertus intus stella lutescenti notatus. Tepala 3-35 cm. connata oblanceolata, exteriora ad 72-80 mm. longa, circ. 26-33 mm. lata breviter apiculata (apiculus circ. 1 mm. longus), interiora subaequalia sed haud apiculata praeter inferiorem angustius circ. 20 mm. lata. Filamenta declinato-incurva, sepalinum superius ad 44-45 mm. longum, sepalina lateralia ad 49-50 mm., petalina lateralia ad 53-55 mm. longa; petalinum inferius ad 49-52 mm. longum; antherae oblongae paullo arquatae ad 32-50 mm. longae; pollen luteus. Ovarium obovato-ellypticum obtu o-trigustrum ad 6.3-7.3 mm. longum circ. 3.5-4 mm. latum. Stylus declinatus ad 85-99 mm. longus. Stigma capitatus obscure trilobatus.

Hab.—In rupestris ad Serra de Natividade civit. Goiás Brasiliae, etiam in Maranhao (mun. Balsas) in lapidosis nemoribus hemideciduis.

Plant about 34 cm. high. Bulb small nearly globose often producing bulblets about 38 mm. wide with a very short pseudoneck. Leaves none when in flower, serotinous moderately firm in texture not flaccid, glaucescent canaliculate about 15 cm. long or less, 2.5-3 cm. broad. Scape cylindrical about 20-40 cm. long, 8 mm. broad. Spathe always 1-flowered bivalved; valves lanceolate rufescent about 31-60 mm. long; inner bract single linear-acute about 11-20 mm. long. Flower declinate scarlet about 7-11 cm. long, 9-10 cm. in diameter widely expanded; marked by a yellowish star in the inside. Tepals connate for 3-3.5 cm., oblanceolate, the outer about 72-80 mm. long, 26-33 mm. broad shortly apiculate (apiculus about 1 mm. long), inner nearly equal but not apiculate, excepting the lower which is narrower, about 20 mm. broad. Filaments declined-incurved, the upper episepal about 44-45 mm. long, both lateral episepal about 49-50 mm. long, lateral epipetal about 53-55 mm. long, lower epipetal about 49-52 mm. long; anthers oblong somewhat arched, about 32-50 mm. long; pollen yellow. Ovary obovate-ellipsoid obtusely trigonous about 6.3-7.3 mm. long, 3.5-4 mm. wide. Style declinate about 85-99 mm. long. Stigma capitate obscurely trilobed.

Hab.—Between rocks or in stony soil on the Serra de Natividade, in the State of Goiás, Brazil; also in southern Maranhao (mun. Balsas) growing among stones in hemiciduous woods.

Specimens.—Brazil, State of Goiás, Serra de Natividade, rocky and stony slopes; leg. Ravenna 157, nov. 1962 (type in the Herb. Ravennae, isotype TRA).

This interesting species is closely related to **A. belladonna** Linn. Actually the flower is very similar in shape, but the one-flowered inflorescence, the aspect of bulb and leaves, and its habit, prove unmistakably that it is a distinct species.

It was found by me in northern Goiás, in rocky places on the Serra de Natividade, the same mountain where Gardner collected so many interesting plants. It was growing under partial shade associated with **Cipura flava** Rav. (Iridaceae). I have seen it again on stony soil, in semideciduous flat-woods of southern Maranhao. Unfortunately the bulbs were lost in cultivation.

Amaryllis restingensis Rav., **sp. nov.** Fig. 18 (subgenus **Omphalissa**)

Planta circ. 70 cm. alta. Bulbus ovato-globosus ad 7 cm. longus circ. 6 mm. latus in collo circ. 10-11 cm. longus productus. Folia ad anthesin incipientia ad 20-28 cm. longa circ. 2-2.5 cm. lata viridia canaliculata obtusa vel subacuta paullo carinata. Scapus pruinosus ad 52 cm. longus ad basin circ. 21 mm. latus. Spatha biflora; valvae subaequales marcescentes ad 5 cm. longae; bracteae interiores duae lineares ad 5 cm. longae. Flores rubri ad 10.5 cm. longi circ. 12.2 cm. lati extus nervis fusco-rubris persinuosis notati. Pedicelli ad 77-82 mm. longi, circ. 6.5 mm. lati. Tepala circ. 12-15 mm. concrescentia ad faciem adaxialem stria media viridia notata, exteriora subolanceolata saepe undulata, exteriori-superius ad 10.5 cm. longum circ. 46-47 mm. latum, exteriori-lateralia apicem versus paullo arquata ad in-

Fig. 18. **Amaryllis restingensis** Rav., **sp. nov.**, native to Guanabara, Restinga, Brasil. Photo by P. F. Ravenna.

teriori-inferius approximata usque 9 cm. longa circ. 3.9 mm. lata, interiori-lateralia recurve patentia ad 9.8 cm. longa circ. 30 mm. lata, interiori-inferius anguste oblanceolatum ad 9 cm. longum circ. 17 mm. latum ad fasciculum staminorum appressum. Filamenta arquate erecto-patentia 4-seriata ad 73-83 mm. longa ad 42 mm. e basinalbicantia vel albo-viridescentia, deinde rubella. Antherae oblongo-reniformes ad 5-5.5 mm. longae, pollen luteus. Paraperigonium subobsoletum in ciliis circ. 0.8 mm. longis reductum. Ovarium oblongum ad 16-17 mm. longum circ. 8.5-9.5 mm. latum. Stylus arquate erecto-patens ad 11-11.5 cm. longus, inferne albo-viridescens superne rubrus; stigma trifidus, lobis circ. 3.5-5 mm. longis.

Hab.—In arenosis littoraneis dictis "restinga" prope Yacarepaguá civit. Guanabara Brasiliae. Crescit prope **Diplothemium maritimum** Mart. **Cereus fernambucensis** Lem. **Epidendrum aellypticum** Grah., **Canavalia obtusifolia** D.C. et caet. Culta in horto meo.

Plant about 70 cm. high. Bulb ovate-globose, about 7 cm. long, 6 mm. wide, produced into a 10-11 cm. long pseudoneck. Leaves incipient when

in flower, about 20-28 cm. long, 20-22 mm. broad, green, chanelled, somewhat carinate, obtuse or subacute. Scape glaucescent about 52 cm. long, 21 mm. at the base. Spathe 2-flowered; valves nearly equal, marcescent, about 5 cm. long; inner bracts two, linear, about 5 cm. long. Flowers bright red, about 10.5 cm. long, 12.2 cm. in diameter with markedly sinuose deep red veins in the outside. Pedicels about 77-82 mm. long, 6.5 mm. broad. Tepals united for 12-15 mm., with a green band on the adaxial face; the outer nearly oblanceolate, often undulate, the upper outer about 10.5 cm. long, 46-47 mm. broad, lateral outer somewhat arched toward the apex, approximating to the lower inner, about 9 cm. long, 3.9 mm. broad, lateral inner recurvely spreading, about 9.8 cm. long, 30 mm. broad, lower inner narrowly oblanceolate, about 9 cm. long, 17 mm. broad, appressed to the stamen-fascicle. Filaments arched ascending, pale greenish from the base to 42 mm., reddish upwards. Anthers reniform-oblong about 5-5.5 mm. long; pollen yellow. Paraperigone nearly obsolete, reduced to whitish cilia, about 0.8-1 mm. long. Ovary oblong about 16-17 mm. long, 8.5-9.5 mm. broad. Style archedly ascending, about 11-11.5 cm. long, white-greenish below, red toward the apex; stigma trifid, its lobes 3.5-5 mm. long.

Specimens: Brazil, Guanabara, Restinga near Yacarepaguá, leg. Ravenna, Sept. 1965 (type in Herb. Ravennae).

This handsome species seems to be the only amaryllid which grows at full sun in the restingas of the State of Guanabara and probably too in all the State of Rio de Janeiro. **A. reticulata** is also found near the sea, but in woods as well as **Griffinia hyacintina** Ker.

It is nearly related to **A. maracasa** Traub, from which is distinguishable by the less flattened bright red flowers; its veins in the outside are sinuose in such a way as to give the flower a squared effect.

Amaryllis argentina (Pax) Rav., comb. nov.

Crinum argentinum Pax, Engler Bot. Jahrb. 11: 325. 1890; **Hippeastrum tucumanum** Holmberg, An. Mus. Nac. Bs. As., ser. III, 5: 153. 1905; **H. candidum** Stapf, Curtis' Bot. Mag. 153: tab. 9184. 1927; **Amaryllis candida** (Stapf.) Traub et Uphof, Herbertia 5: 123. 1938 (non tratt nec Lindl.); **A. tucumana** (Holmb.) Traub et Uphof, loc. cit.: 124; **Amaryllis immaculata** Traub et Moldenke, Amaryll. Tribe Amarylleae, 108. 1949; **Hippeastrum argentinum** (Pax) Hunziker, Kurtziana 4: 13. 1967.

Hab.—It grows in mountains of the provinces of Catamarca, Tucumán and Salta, especially on sandy places or between rocks. **Crinum argentinum** (Pax) was an earlier binomial for the species. The complete list of synonyms is given.

Specimens.—Argentina, Catamarca, dept. Andalgalá, common in slopes at El Suncho, 1600 m; leg. Joergensen 1481, II-1915 (SI). Tucumán, dept. of Capital, river Sali, 500 m; leg. S. Venturi 1283, 26-X-1921 (SI, LIL). Dept. Tafi, Tafi del Valle; leg. Schreiter s/n, 15-IX-1941 (LIL). Idem, La Hoyada, 1500 m; leg. Schreiter 4187, 18-XI-1923 (LIL). Idem, Sierra de San Javier; leg. Schultz, IX-1880 (phototype from F 9960, the type at B). Dept. Burruyacu, river Toro; leg. S. Venturi 2733 (LIL). Idem, Quebrada de Lules; leg. Schreiter 1379, 28-X-1920 (LIL). Dept. Trancas, Trancas; leg. M. Lillo 9809 (LIL). Salta, dept. Candelaria, Sierra de la Candelaria, 1200 m; leg. S. Venturi 3671, 2-II-1925 (SI).

Amaryllis argentina (Pax) Rav., ssp. **plicatilis** Rav., **ssp. nov.**

A subspecies argentina hypanthio viridi, foliis erectis prater tertium superiores vel infram arcte conduplicatis recedit.

Hab.—In montibus provinciae Jujuy Argentinae regionibus Tilcarae Tumbayae et caet. Culta in Hortus Botanicus Castelarensis, et in horto meo Bonariae.

It differs from the typical subspecies because of the green hypanthium and its erect stiff leaves, which are strongly conduplicate for much of their length.

Hab.—Mountains of the province of Jujuy, Argentina, near Tilcara, Tumbaya and other places.

Specimens.—Cultivated in the botanic garden of Castelar and in my collection from bulbs obtained from the province of Jujuy, Argentina; leg. Ravenna 505, dec. 1967 (type in Herb. Rav., isotype BAB). Argentina, Jujuy, dept. Tilcara, Yala de Monte Carmelo, 2900 m; leg. Fabris et al. 6446, 19-21-I-1966 (LP). Idem, dept. Sta. Bárbara, on the way to El Fuertè, on front of Madrejón; leg. Cabrera 16253, 23-X-1964 (LP). Idem, dept. Tumbaya, Chilcayo, Quebrada Grande, 2400 m; leg. Fabris et al. 6286, 8-I-1966 (LP).

This is apparently the plant which is cultivated in the United States as **Amaryllis candida**. The subspecies **argentina** has spreading, somewhat recurved, not conduplicate leaves, as in many other species of the genus.

Fig. 19. **Amaryllis reticulata** L'Hérit., as found in Misiones, Argentina. Photo by S. Magno.

Amaryllis reticulata (Fig. 19) in the flora of Argentina

During my searches concerning the identification of **Amaryllis petiolata** Pax, a dry specimen from the province of Misiones, which was determined as this species, proved to be **A. reticulata** L'Her. Thus, the presence of the latter in Argentina is here reported for the first time.

It is not the first case about species from the east side of southern Brazil, which are found in the Argentinian Mesopotamia (including Misiones) or in Paraguay. Among them, **Neomarica candida** (Hassl.) Sprague (Iridaceae) and **Zephyranthes flavissima** Rav. have such discontinuous ranges.

Recently, it seems that also a **Crinum** species has the same peculiar distribution.

Our plants belong to the typical form, without the white streak on the leaves.

Specimens.—Argentina, Misiones, Campiña de Américo; leg. C. Spegazzini (BAB 16700, SI); Argentina, Misiones, dept. of La Frontera, Campiña de Américo; leg. C. Spegazzini, 2-III-1907 (BAB 16701 & 16703, SI), Idem ibid., Barracón; leg. C. Spegazzini, 3-III-1907 (BAB 17154).

The real country of **Amaryllis vittata** L'Herit. Fig. 20

Most of the **Amaryllis** hybrids so appreciated in gardening, were obtained by crossing **A. aulica, A. reticulata, A. reginae, A. vittata** and a few others. Some of the commonest forms in gardens are the striped form known as "vittata hybrids". These come from the first reported breeding attempts in the genus: **A. X johnsonii**, a hybrid between **A. reginae** and **A. vittata.**

The place of origin of **A. vittata** was quoted as "Andes of Peru" but this has not been verified. In fact the species has not been collected in Peru and the exact range remains a mystery up to the present.

Due to the above mentioned reasons, the discovery of this species among dry material from the States of Santa Catarina [1] and Rio Grande do Sul,[2] in Brazil, appeared to be an extremely interesting event. The original text and especially the figure from L'Heritier's Sertum Anglicum (p. 13, tab. 15) were examined and no doubts remained about the identification. This was reinforced by comparing some photographs (one of these is reproduced in Fig. 20), made by P. R. Reitz, after L'Heritier's drawing.

In the 1966 Plant Life (see Fig. 12 in that publication), R. E. Herold reports on a cultivated plant identified as **Amaryllis vittata**, but the flowers are declined, and should apparently be regarded as a hybrid involving **A. belladonna** and **A. vittata.**

The species was collected in the past, in Santa Catarina, by Tweedie. The specimen, consisting of a sole flower, was deposited at Kew and served Herbert for erecting **"Hippeastrum ambiguum** var. **tweedianum"**. This variety was transferred by Traub (1958), to **A. vittata** L'Her. var. **tweediana** (Herb.) Traub, the last combination. As Baker says (1888), "it varies much in the size of the flower and distinctness of the stripes". This point proved to be true also in the wilds, varying somewhat also in shape, and number of flowers in the inflorescence. The slight differences does not warrant a specific name. Therefore the variety **tweediana** should be included in synonymy as following:

Amaryllis vittata L'Heritier, Sert. Angl.: 13, pl. 15. 1788; **Hippeastrum vittatum** (L'Her.) Herbert, App. Bot. Reg.: 31. 1821; **Amaryllis lineata** Colla, Hort. Rip.: 3. 1824; **A. superba** Bury, Hexand. Pl: pl. 31. 1831-34; **Hippeastrum ambiguum** Hook. var. **tweedianum** Herbert, Amaryll.: 136, tab. 22, f. 3. 1837; **Hippeastrum solandriflorum** Herb. var. **tweedianum** Herbert. Curtis' Bot. Mag. 66: tab. 3771. 1841; **Chonais vittata** (L'Her.) Salisbury. Gen. Pl. Fragm.: 135. 1866; **Amaryllis vittata** (L'Her.) var. **tweediana** (Herb.) Traub, Amaryll. Man.: 268. 1958.

Specimens.— Brazil, Santa Catarina, mun. Campos Novos, Palmares, 900 m; leg. Klein 4085, 28-X-1963 (HBR). Idem, Marombas; leg. L. B. Smith & R. M. Klein 13349, 16-XI-1964 (HBR). Idem ibid.; leg. Reitz 6748,

[1] The material was sent to the writer, by the staff of the Herbarium "Barbosa Rodrigues" (HBR.), in order to carry out the **Amaryllidaceae** for the "Flora Ilustrada Catarinense".

[2] Herbarium Anchieta (PACA); the material was studied in the Escola de Filosofia at Sao Leopoldo, State of Rio Grande do Sul, Brasil.

22-XI-1964 (HBR). Idem, Campos Novos, 1000 m, campo humido; leg. Klein 4212, 29-X-1963 (HBR). Rio Grande do Sul, mun. Canoas, Esteio, in fossa; leg. P. B. Rambo 752, 5-X-1933 (PACA). Idem, via ferrea; leg. P. B. Rambo, 5-X-1933 (PACA 33948). Idem, Padres, 23-I-1957 (PACA 60220). Idem, Sao Leopoldo; leg. L. Pheissen 129 (PACA).

Fig. 20. **Amaryllis vittata** L'Hérit., native to southern Brasil. Drawing by P. R. Reitz after the figure of L'Héritier.

IV. **NOTHOSCORDUM** NOTES, 1968

Nothoscordum felipponei Beauv. ssp. **lorentzii** (Hert.) Rav. (Fig. 21)

On page 50 of the 1966 edition of Plant Life, the new combination **Nothoscordum lorentzii** (Hert.) Rav. was made. Having had access only to a dry specimen, at that time this position seemed correct. Lately however, after having the opportunity of studying large populations in the field, it became clear that our plant must be regarded as a subspecies of **N. felipponei Beauv.:**

Nothoscordum felipponei Beauv., ssp. **lorentzii** (Hert.) Rav., **comb. nov.**

Beauverdia lorentzii Herter, Boissiera 7: 509. 1943; **Iphcion lorentzii** (Hert.) Traub, Pl. Life 5: 50. 1949; **Tristagma Lorenzii** (Hert.) Traub, Pl. Life 19: 61. 1963; **Nothoscordum lorentzii** (Hert.) Ravenna, Pl. Life 23: 50. 1967.

Plant about 6-12 cm. high. Bulb subglobose or depressed-globose, about 20 mm. wide, covered with whitish or sometimes pale ochraceous coats;

pseudoneck present. Leaves a deep green, linear, with ciliate margins, moderately canaliculate, about 10-19 cm. long, 2-3.4 mm. broad. Scapes often more than one for each bulb, somewhat compressed, often puberulent, about 7-10 cm. long, becoming decumbent after flowering. Spathe one-flowered; valves membranous, lanceolate, ventricose, about 16-17 mm. long,

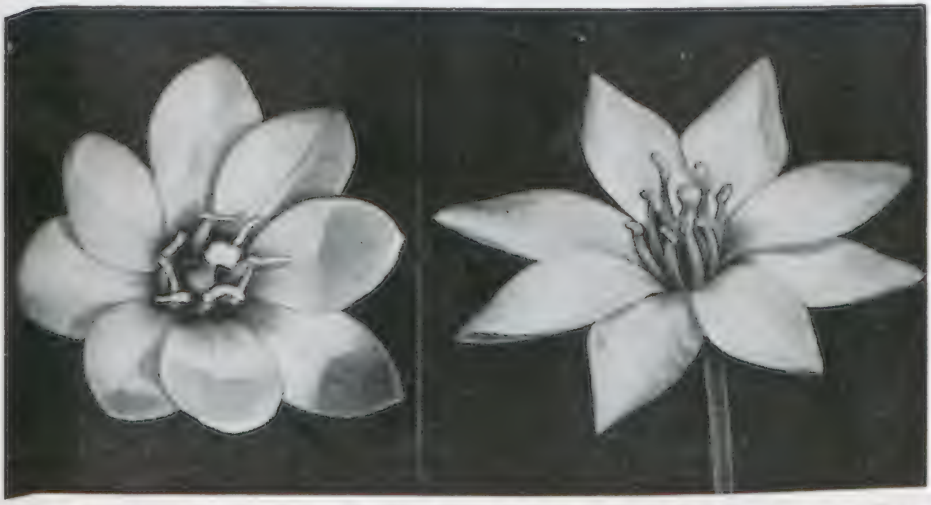

Fig. 21. **Nothoscordum felipponei** Beauv. ssp. **lorentzii** (Hert). Rav., native to southern part of Province of Entre Rios, Argentina.

connate for 2-2.2 mm. at the base, sometimes with purplish streaks. Pedicel often puberulent, about 5-15 mm. long. Flower yellow, about 28-33 mm. in diameter. Tepals always eight, oblanceolate, blunt or acute, about 20-23 mm. long, connated for 3 mm. toward the base, the outer four slightly longer than the inner, tinged with reddish-brown, or sometimes with a green streak, on the abaxial face, the inner not striped. Stamens eight, in two sets, its filaments oblong-subulate, yellow, the four episepals about 8 mm. long, the epipetals to 9.5 mm. long; anthers versatile, oblong, sometimes slightly arched, about 2.5-3 mm. long. Ovary ellipsoid, green, about 5-5.4 mm. long, 3-3.2 mm. wide. Style broadly filiform, about 6-6.5 mm. long; stigma thick, capitate, whitish, sometimes irregularly lobed.

Hab.—Apparently only in the south of the province of Entre Rios, Argentina. It grows near **Nothoscordum bonariense** (Pers.) Beauv. (two varieties), N. vittatum (Gris.) Rav.; sometimes also with **N. inodorum** (Ait.) Nich., ssp. **N. montevidense** Beauv., **Tristagma tweedianum** (Bak) Traub, and **Sisyrinchium pachyrhizum** Bak. (Iridaceae). Cultivated in my collection.

Specimens.—Argentina, Entre Rios, dept. Concepción del Uruguay, Campichuelo, banks of the river Uruguay; leg. Burkart & Troncoso 24138, 10-IV-1963 (SI). Idem, Agricultural Exp. Farm., in fields of rice; leg. Ravenna 625, Apr. 1967 (Herb. Rav.). Idem, dept. Gualeguaychú, near Gualeguaychú, on the way to the stream Gualeyán; leg. Ravenna 623, Apr. 1967 (Herb. Rav.).

This plant (Fig. 21), separable as a species is distinguishable from **felipponei** on account of its amazing tetramerous flowers, its thicker stigma, the ciliated leaves, the almost always pilose scapes and pedicels, and its repellent alliaceous smell. Moreover this is a fall-blooming (April), in contrast with the type which flowers in August-September.

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FLORA OF ALASKA AND NEIGHBORING TERRITORIES. by Eric Hulten. Stanford University Press, Palo Alto, Calif. 1968. Pp. xxii + 1008. Illus. $35.00. This is apparently the definitive work on the Flora of Alaska (U.S.A.), and Yukon and Northwest Territories (Canada), and the eastern extremity of Siberia (USSR). Some 1,974 taxa, belonging to 1,559 species are described: for 1,735 of these detailed descriptions, nomenclature, plant drawings and range maps are provided. There is an artificial key to the families and an analytic key to all species of each genus. The introduction is concerned with the past and present climatic, geologic and ecologic character of the regions covered, and the history of botanical collections. The glossary, plant author's list, bibliography and indexes complete the volume. This excellent book is highly recommended to all interested in the Arctic flora.

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3. GENETICS AND BREEDING

BIGENETIC HYBRID OF SPREKELIA AND HABRANTHUS

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The writer's experience in combating sterility in inbred *Amaryllis* strains has suggested experimentation with hybrids between genera. One cross that was apparently successful used a free-blooming clone of *Sprekelia formosissima superba* as seed parent and a vigorous form of *Habranthus robustus* as pollen parent.

Fig. 22. **Sprekanthus cagei Traub, bigeneric hybr. nov.**, center, a bigeneric hybrid involving **Sprekelia formosissima** and **Habranthus robustus**, made by John M. Cage of Palo Alto, Calif. Ruler is 1-inch wide.

Seedlings are very uniform in appearance and growth habit. In two years of growth in a cool greenhouse, the leaves reached a mature height of about 14 inches and a width at the base slightly exceeding $\frac{1}{4}$ inch. Maximum width at a height of 10 inches is $\frac{3}{8}$ inch. The leaf shape resembles *Sprekelia*, but the size is smaller than either parent (Fig. 22). The color of the foliage is dull medium green.

Semi-dormancy occurs in winter. However, blooming does not seem to be clearly related to dormancy. Three of the bulbs have bloomed to date, all at different times, even though all were grown in a community pot. Next season, the plants will be forced into deeper dormancy to encourage free blooming.

The mature bulbs are 1¼″ to 1½″ in diameter and have the long neck shape of *Sprekelia*. They are slightly smaller than the *Habranthus* bulbs of their parent and much smaller than *Sprekelia*. Offsets are produced sparingly.

The beautiful single bloom develops rapidly on a slender scape hardly more than ¼″ in diameter and about 16 inches in height. The form of the blossom is nearly identical with that of *Sprekelia*, but the size is only about one-third. Apparently the flower lasts somewhat longer than *Sprekelia*.

The color is scarlet with a hint of the lavender from *Habranthus*. Two of the flowers were of solid color to the very bottom of the throat, unlike the green-throated *Sprekelia* parent. The other blossom had faint stripes of pale green deep in the throat.

The hybrid seems to be a true mule. Selfing seems totally ineffective, and a back-cross on *Habranthus* forms seeds that are not viable. Further efforts will be made to develop a fertile new plant type.

If viable seeds can eventually be obtained either by selfing or back-crossing, some interesting possibilities exist. Since we have the white-flowered *Habranthus* available, we may produce a white *Sprekelia* form in due course, as well as other colors. The writer believes that selfing can be obtained if the right treatment is found.

The possibility that the *Sprekelia-Habranthus* cross could be made was predicted by Traub in his book, The Genera of Amaryllidaceae (1963). He indicated that x=6 is the basic chromosome number for the *Amaryllidaceae* as a whole, and also the tribe *Zephyrantheae* in which he placed *Habranthus* and *Sprekelia* among other genera. Previously, most lineagicists had placed *Sprekelia* in the same tribe with *Amaryllis* L., and that was apparently wrong. Of course, a cross of *Amaryllis* and *Sprekelia* [often attempted but never realized.—Ed.], though highly unlikely, would evoke some consternation.

In PLANT LIFE, Vol. 23, 1967, Flory & Bose speculate in their paper, "*Sprekelia* Chromosomes", that the highly polyploid commercial *Sprekelia* may have a basic chromosome number of x=6. Since 2n=12 appears in at least some *Habranthus* species, the writer's hybrid may tend to support the above hypothesis.

× SPREKANTHUS, BIGENERIC HYBRID

The Sprekelia-Habranthus hybrid has been named for the originator, × Sprekanthus cagei.

× Sprekanthus Traub, bigeneric hybr. nov. et, **Sprekanthus cagei Traub, hybr. nov.** typus. Planta hybrida "Sprekelia formosissima superba" et "Habranthus robustus" intermedia; colore plusminusve inter parentes medio; aliter velut in parenta foeminea sed parviora. Holotypus (Holonomenifer): John M. Cage No. 1 (= TRA 1087), Febr. 15, 1968. Fig. 22.

Hybrid between Sprekelia **formosissima superba** ♀ and **Habranthus robustus** ♂. Plant more or less intermediate in color between the parents; otherwise similar to the seed parent but smaller.—**Hamilton P. Traub**

HYBRIDIZING WITH AMARYLLIS SPECIES—1968

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LONG-TRUMPET HYBRIDS

1968 will be remembered by me as the year of the long-trumpets. The first important event was the flowering of *Amaryllis fragrantissima* very early in January. Presumably, this was the first flowering of this species outside of Bolivia. *A. fragrantissima* is a truly magnificent species and even finer in some respects than had been anticipated from Dr. Cardenas' description (Plant Life, Vol. 16, 1960, P. 32-33). The two florets were about 20.5 cm. long (tepaltube about 9.5 cm.) and about 13 cm. in diameter. They were on a very tall, robust scape (68-70 cm. tall) and were held almost horizontally and nearly 180° apart. The substance, regularity, and intensity of whiteness of the segments were outstanding. The fragrance also was delightful; it was detectable two or three rooms away from the flowering plant but was in no way overpowering or objectionable at a distance of only three or four feet.

Since *A. fragrantissima* bloomed so early in the year, there was very little fresh pollen available and this was probably fortunate. One floret was self-pollinated and this gave rise to a seed pod which required nine weeks to mature in a greenhouse at temperatures of 45 to 75°F. with an average probably near 55°F. The seed were quite normal in appearance and germinated very well, approaching 100%. The seedlings are now (July 15) putting on their fourth leaves and for the most part appear moderately vigorous. A pollination with mixed pollen of a white leopoldii hybrid and *A. cransiae* failed to set seed. This particular clone of *A. fragrantissima* is amazingly vigorous. Since flowering it has grown 12 leaves, each one near the size of those of modern large hybrids.

The pollen of *A. fragrantissima* gave viable seed with the following pod parents: *A. striata* var *fulgida; (A. belladonna* x *A. striata)* x 'Senorita'; orange reginae x 'Senorita'; Ludwig's 'Constant Comment'; and Ludwig's 'Fantastica'. Although seed pods were set, no viable seed were obtained from a white leopoldii and a red leopoldii. Of course, it is not known if the trumpet shape and size of *A. fragrantissima* will be dominant in these crosses; if not, back-crosses with *A. fragrantissima* will be desirable. Also, more crosses are needed in the bright colors (red, orange, and rose pink or pink) to get trumpet flowers in these colors. Pollen of *A. fragrantissima* was disseminated fairly widely and some successes are known to have been achieved by others.

The second event of major importance was the flowering in May of a second long-trumpet. This plant was very generously turned over to me by Mrs. U. B. Evans of Haphazard Plantation, Ferriday, Louisiana, who in turn had gotten it from the late Prof. Ira S. Nelson. The history of 'Evans trumpet' prior to this time is apparently lost. 'Evans trumpet' had grown well outdoors in Mrs. Evans' garden for several

and appears to be a form of *A. ambigua;* the coloring is almost
cal but the size of the florets (six) is somewhat smaller (14.5 cm.
nd 7.0 cm. tepaltube). Since the plant was dug from Mrs. Evans'
n after the scape had started up and a considerable part of the
root system was damaged or lost, this may account, in part, for
naller size. The bulb and foliage are large, near large hybrid size,
pparently it does not make offsets. However, the really wonderful
teristic is that 'Evans trumpet' appears to be quite fertile to
pollination and quite a few seed were obtained from pollination
A. fragrantissima (two pods), also one seed pod from pollen of a
w long-trumpet" grown by a friend in California and also a pod
mixed pollen of the "yellow long-trumpet" and a seedling of
g's 'Maria Goretti' x 'Senorita'. All seed germinated rapidly
e seedlings are now showing one broad, dark green leaf. Although
ies for a literature search are limited, no reference has been seen
ning crosses where both parents were long-trumpets and so these
e the first. 'Evans trumpet' failed to set seed to self-pollination.
fore, it is behaving very much as we have come to expect many
llis species to do, very fertile to cross-pollination and sterile to
llination. Since it appears not to make offsets and is self-sterile,
gress can be made in multiplying this species until possibly an-
clone of this "fertile *A. ambigua*" is found or the rather drastic
f cuttage is employed. Pollen from 'Evans trumpet' was used on
-flowering, pink semi-miniature from Ludwig's 'Constant Com-
x 'Senorita' and a number of seedlings have just put out their
af. These first leaves are much narrower than those from 'Evans
et' as the seed parent. In any event, 'Evans trumpet' is a most
e and valuable addition to a species collection and a really lucky
for me.

ther long-trumpets have been acquired. A blooming size *A. viridi-*
rom Bolivia has grown four long narrow leaves this Spring and
loom next year. *A. immaculata* has been obtained from Holland
expected to bloom next year. So, maybe more long-trumpet
are just around the corner.

THE QUEST FOR YELLOW HYBRIDS

edlings from the following crosses bloomed in 1968. (See Plant
ol. 24, 1968; p. 69, 70.)
) [A. evansiae x A. aglaiae x A. evansiae] x 'Maria Goretti' (two
).
) 'Maria Goretti' x (A. evansiae x White Dutch) (four plants).
) 'Winter Carnival' x (A. evansiae x White Dutch) (one plant).
course, none of them was yellow. Most of them showed faint
erate amounts of very pale yellow in a large throat area just as
oret was opening. However, this had changed by the next day
n in the throat and a creamy white further out on the segments.
owed some pink, red or orange-red coloring. One was a quite
ble, pale pink blush with more tendency toward yellow than the
Several had considerable light red on the outer parts of the

segments and were fairly attractive but not near the hoped-for
The really discouraging point was the sterility exhibited by these p
all self-pollinations failed and only one sib cross gave a seed pod b
seed failed to germinate. Next year an additional six to eight
from these crosses should bloom and maybe some of them will be f
However, this problem may require a really massive attack and
fore five additional clones of *A. evansiae* have been obtained fro
Alek Korsakoff of Jacksonville, Florida. Since these are seedlings
three fertile clones of *A. evansiae*, it is hoped that they will set
seed with pollen from a number of different white leopoldii hybri
that these offspring will, in turn, have a greater tendency to be fer

A number of seedlings flowered this season from 'Firefly'
evansiae x White Dutch), a cross of which I was not particularly
and which has not been mentioned previously. Most of the see
were fairly uninteresting, a light, dull orange-red in an interm
size. However, one turned out to be quite different, a light reddis
with a broad edging of darker red around the segments. This is a
of a completely different sort from those currently on the market.
floret was about 4½ inches and had some suggestion of a semi-tr
It produced viable seed with pollen from a good 'Ludwig Picote
'Nivalis' but did not accept pollen from *A. evansiae*. Possib
lesson here is that occasionally (very infrequently might be bet
"far-out" cross may result in something quite new and different

Very beautiful flowers resulted from another cross havi
evansiae in its ancestry. Maria Goretti x [(*A. belladonna* x White
x (*A. evansiae* x White Dutch)].

In two of these siblings, the color of the 6½ inch florets was
a very pale (yet bright) pastel pink blush not available in comm
hybrids. The relatively large throat area (good leopoldii form
pale, bright green and the combination is quite attractive. The
had reduced fertility but a few self and sib seedlings were obtain

An undesirable characteristic has been confirmed in 'Morris
(see Plant Life, Vol. 24, 1968; p. 70); it is very susceptible t
fungus" even in the greenhouse. Further, its seedlings and als
of 'Senorita' have shown poor winter survival outdoors when m
with bagasse which gives good results with most other hybrid am
This is unfortunate since a major objective of this program is to p
hybrids which will survive long range outdoors in our climate. I
tion, because of greenhouse space limitations, seedlings can be
only their first winter in the greenhouse and then they must go ou
Some crosses survive much better than others and possibly exp
will teach us more about what to expect.

THE AULICA GROUP

Only one cross of interest was successful in the aulica gro
year: *A. forgetii* x *A. cybister*. Only three seedlings resulted
case. This is a rather far-out cross and it is difficult to imagin
the foliage characteristics will be from the strongly evergreen *A.*
and the strongly dormant *A. cybister*. Further, *A. forgetii* bl

December-January and *A. cybister* in March-May. The flowers are compatible at least from the standpoint of very short tepaltubes and possibly this is a small beginning into the orchid-flowered hybrids.

ACKNOWLEDGEMENTS

As I continue to work with *Amaryllis* species, several other people have given valuable assistance. A number of species that I did not have were available from Mr. and Mrs. Alek Korsakoff, Jacksonville, Florida. Mr. Korsakoff also sent pollen. In California, Mr. W. Quinn Buck, Mr. J. L. Doran and Mr. S. S. Harshbarger all helped greatly by exchanging pollen, seed and plants.

SUITABLE POTTING MEDIUM

Finally, a tip should be passed on about a growing medium that has been very valuable to me for germinating the delicate seed that often result from species crosses. "Redi-earth" made by the W. R. Grace Co. appears to have all the attributes required of a good potting mix. At the present, it has been adapted as a germinating medium as follows: Fill the pot or flat with an acceptable soil, sand, leaf mold, dehydrated manure mixture to within ½ inch of the desired level in the container. Wet thoroughly (drainage must be excellent) and smooth. Add about ¼ inch of previously moistened "Redi-earth" and smooth and wet thoroughly. Place the seed next; they need not be set vertically but should be arranged with respect to spacing. Add a second ¼-inch layer of previously moistened "Redi-earth" to completely cover the seed and wet thoroughly. This is a fairly rapid planting procedure. This medium is very porous but holds moisture extremely well. However, it should be wet thoroughly at intervals, depending on the humidity, if there is the slightest sign of drying out. Germination is rapid and complete within the capacity of the given seed to germinate.

AMARYLLIS FROM IRRADIATED SEEDS

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During the Fall of 1967, a number of packets of seeds were sent to an Oak Ridge Radiation Laboratory and all were irradiated with 15,000 roentgen units of nuclear radiation. Among these seeds were 2 lots of *Amaryllis* seeds: (1) *Amaryllis striata* forma *fulgida* and none of these of mine have survived, and (2) *Amaryllis* hybrid in the "Dutch Type" with large red flowers which were pollinated by two different seedling clones of *Amaryllis striata* forma *fulgida*. It is these latter which are now growing and which show variations from the norm. Dr. Traub has written that there are several plants of his which show definite effects of the irradiation. The writer's seedlings were divided into two groups of which the first group were grown as they came back from the irradiation laboratory and the second group were further treated with

a solution of colchicine, gibberellic acid and "Rootone". These latter if they survived the treatment and after sulking for a while make a rank growth that outgrows anything else that the writer has yet grown. In the straight 15,000 R. units treated group of seedlings, there were noticeably seedlings which had a pronounced "curl" to the initial leaf or two, some still appear somewhat stunted and even one after better than 6 months in the soil, it has yet to put forth its first leaf.

Since it was the writer's desire to induce as wide a spectrum of changes in as short a time as possible, various other treatments are being tried this year such as stem injection with a colchicine solution which may overcome the shortcomings which Dr. Henry M. Cathey writes that it has been generally found in *Amaryllis* treated seedlings that diploid tissues overgrow the tetraploid formed tissues and crowd them out.

1968 AMARYLLIS BREEDING REPORT

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The writer has been surprised and confused a number of times in the past two years by the behaviour of certain *Amaryllis* clones, both hybrids and species, which apparently has been caused by their being moved about the country. The bulbs were first moved from a high altitude in Colorado to sea level here in California. Now, bulbs that once grew in the fall (as *A. aulica*) are growing in the spring; others do not want to grow at all here in California; and many have changed considerably both in color and shape of the flowers. One bulb in particular that was a beautiful light pink in Colorado has here produced such dark rose flowers of quite different shape that it was not at first recognizable as the same clone, and yet it had to be the same! Even a move this past February from one location to another one here in the same city has resulted in a difference in the color of the flowers, most blooms this spring being much darker in color than in the previous year. The only conclusion that could be drawn from these experiences was that the character and color of the flowers must be greatly influenced by such factors as *light intensity* at flowering time, soil in which the bulbs are being grown, and perhaps other unknown factors. Hence, the writer was pleased to read in the 1968 Yearbook that Mr. Caldwell had come to the same conclusion in accounting for the unstable color in *Lycoris houdyshelii*.

WINDOW-SILL HYBRIDS

In many respects, the most satisfactory of all the bulbs that the author has raised from seed are the bulbs which he calls his "Window-sill hybrids". Some of these were described in the 1968 Yearbook, but more details can now be added. All of these hybrids had as one of the parents the old orange-scarlet hybrid sold by Cecil Houdyshel under the label of "Rutila hybrids". Ten successful crosses were made with

this clone, seven of which have already bloomed. A self was a very poor grower, but the other six have been characterized by compact foliage, attractive flowers, dependable blooming, and vigorous growth.

Crossed with a Van Meeuwen white Dutch clone, it produced large flowers of orange red, some of which had deeply reflexed tepalsegs. Crossed with a dark red Mead hybrid, it gave 5″ flowers of vivid crimson. Crosses made with a scarlet Indian miniature, and with a white and pink clone of unknown ancestry, both gave flowers identical in color to the original Houdyshel hybrids. Crossed with *A. striata fulgida*, it produced flowers from 4″ to 5″ in size, in shades of orange, and revealing their Striata ancestry in both flower and leaf; these bulbs bloom naturally in mid-winter. The best cross thus far of the ten was the one made with a Ludwig pink Dutch clone. The last bulbs to bloom of this cross finally bloomed this spring at six years of age, with 5½″ flowers which were a blend of rose, white and green in color. Previously there had been flowers in red, dark rose, and white with red markings. Both this cross and the previous one have been used extensively in additional crosses.

When the self bloomed three years ago, it was crossed with a red and white Peruvian Miniature clone, and the plants being raised from this cross are the ones mentioned in the 1968 Yearbook as having the thick gray-green leaves which are so resistant to cold weather and give such a good appearance the entire year. None of these seedlings have bloomed yet, but they are being closely watched. It is rather ironical that the hardiest plants being raised had as one parent this self which was so tender that it perished this past winter when kept outside.

SEARCH FOR RECURRENT-BLOOMING HYBRIDS

The search for recurrent-blooming hybrids is being continued, but with very little success thus far. Up to now, the writer has been working primarily with hybrids of *A. striata*, and although some of these would definitely be recurrent bloomers when grown in a greenhouse, they certainly are not when grown outside. However, by crossing these Striata hybrids with free-blooming, hardier clones of other ancestry, a free-blooming type suitable for outdoor culture in a cool climate may be developed, and so the search continues.

The most promising material grown this past year has been a group of Striata crosses originally made by a friend in Pasadena. Some of the seedlings were raised in his greenhouse in Pasadena, and some by the author in outside plant benches in Torrance. The first and basic cross was between *A. striata fulgida* and a white Dutch clone; these seedlings produced medium-sized flowers of bright orange with a green throat. There was one exception, for one bulb produced a picotee type flower of red on a white background. This bulb bloomed four times within a year, but it was in a greenhouse most of this time. When it bloomed this spring, after having been outside during the winter, the flower was much superior to previous blooms with better color and better substance. However, it refused to start new leaf growth after blooming and eventually perished.

This basic cross has been used in a number of additional crosses by both the author and his friend, having been crossed with 'Tangerine', 'Skildway', *A. evansiae*, and hybrids of *A. aulica, cybister,* and *striata,* as well as being selfed. Two of these crosses have bloomed and are worthy of comment. The first was a self on one of the orange-flowered hybrids. The seed began to germinate Feb. 7, 1966 in a sunny house window, and the seedlings were raised in an outside plant bench. The first one bloomed March 12, 1968, from a bulb only a little over one-inch in diameter. An even smaller bulb tried to bloom, but failed. This first flower was small, under 4″ in diameter, but it may be larger in another year; in color it was a rose red on a white background. The encouraging factors are that this cross is blooming from such small bulbs, and so quickly with outside culture.

The writer's friend in Pasadena also crossed one of the orange-flowered clones of the basic cross with *A. evansiae,* and gave one seedling—the largest—to the writer. After trying to bloom twice last fall, and failing each time, this seedling finally bloomed in May of this year, just a little over two years of age. The short scape produced three beautiful flowers about 4″ in diameter. The color was rather unusual, for the upper half of the flower was a much darker red than the lower half, with a distinct dividing line between the two halves, bisecting the two middle segs. Each tepalseg was tipped with white, and the large star in the throat was a chartreuse green, edged by a narrow band of red purple. This bulb refused to set seed, but it was successfully crossed with a Ludwig white Dutch clone. It is going to be crossed with other hybrids of *A. evansiae* as soon as possible, and in fact, pollen from the graceful hybrid of *(A. evansiae* x *A. aglaiae)* x *A. evansiae* was used on the flower, but the cross failed to take. Incidentally, out of fourteen crosses made with this same pollen, only two crosses yielded any seed, illustrating the point that perseverance pays in the end, since one never knows which crosses will or will not be successful.

MINIATURES

The biggest thrill experienced in the 1968 blooming season came when the first bulb bloomed of a cross between a dark red Indian miniature and a South African clone having large flowers of an unusual shade of rose. This Indian miniature is a recurrent bloomer, and that was the reason for the cross being made in 1964, but the seedlings have grown very slowly. However, the first flower was well worth the wait, because it was a beautiful miniature, in color a glowing dark scarlet with an even darker throat (Fig. 23). The flowers were 4½″ in size, but did not appear to be that large because the tepalsegs were so heavily ruffled, and the blooms were carried so gracefully on a slender scape. The foliage was in correct proportion to the size of the flowers, which even had *quite a fragrance.* The writer would rate this hybrid as the finest one he has yet raised from seed. There are five more bulbs of this cross still to bloom, and since all have small foliage, all will probably be miniatures.

The writer has never been particularly fond of miniature *Amaryllis*, preferring bloom of 5″ to 7″ in diameter, but this new miniature flower is so attractive that he will have to add to his goals one of developing ruffled miniatures patterned after this one. Therefore, a number of crosses were made with it this year.

Many of the Striata crosses, made with the objective of securing recurrent bloomers, are also producing miniature flowers. Of the fourteen Striata crosses which bloomed this past spring for the first time, ten of them produced miniature flowers between 3″ and 4½″ in size, some with

Fig. 23. New ruffled scarlet miniature **Amaryllis** hybrid raised by V. Roger Fesmire, Torrance, Calif.

reflexed or ruffled segments and some of regular form. From a cross between 'Tangerine' and *A. striata fulgida* was secured one miniature with a flower 3½″ in diameter and of good though plain form. It was a clear pale orange in color, with a trace of green and purple in the throat, a rather beautiful flower, but it also refused to set any seed. Another of these Striata crosses, involving the Houdyshel orange scarlet hybrid, a white Dutch clone, and *A. striata fulgida*, produced a real miniature flower, only 3″ in diameter. This pale rose bloom was also quite ruffled, but the shape was not so good since it displayed the peculiar Striata "swan's neck".

Among the Peruvian Miniature Hybrids raised from seed by the writer is one that truly is a miniature. This one has flowers that are barely 3″ in diameter, white in color with the tips of the tepalsegs being a light rose, and with a green throat. In addition, this flower is definitely a long-trumpet type, which fact was not perceived until this spring. Now this might be usable in developing long-trumpet hybrids, for which there is a need. However, it has been the writer's experience with these Peruvian hybrids that they give very poor results when used as the seed parent, although they are satisfactory as a pollen parent. So far only one cross has been successful with this particular Peruvian Miniature, and the seedlings are growing very slowly. Pollen from an unidentified yellow long-trumpet species was secured from a friend and used on this miniature when in bloom, but it refused to set seed. However, all of these Peruvian Miniatures are good growers and next time the story may end differently.

In the summer of 1965, from a field of *Amaryllis* in the San Fernando Valley, some seeds were secured of what was apparently a self on a Diener hybrid crossed with white Dutch. Two of the plants raised from this seed bloomed for the first time this past April, and both produced well-formed flowers about 4½″ in size, one being a dull red in color and the other a rose red. These were shown to some friends, including Mr. Quinn Buck, who immediately identified them as Diener hybrids, even before knowing their history. *A. argilagae* was in bloom at that time in his greenhouse, and a cross was made between it and one of these Diener hybrids. Fortunately, it was successful, and this should give some real miniatures. The writer's bulb of *A. argilagae*, grown outside, bloomed at the end of June, but no crosses were successful.

Last year, every cross made with pollen from a Senorita hybrid was a failure. This year, using pollen from a different source, every cross made with it was successful, as were also the crosses made with pollen from a hybrid of Senorita X *A. calyptrata*. This experience corresponds with the observation reported by Mr. Mertzweiller in the 1968 Amaryllis Yearbook. In the opinion of this writer, these Senorita hybrids offer intriguing possibilities for developing a new race of graceful miniature *Amaryllis*, and so he was quite pleased to finally succeed in crossing the Senorita hybrid on to his previous hybrid of the Houdyshel orange-scarlet clone X *A. striata fulgida*. This cross was described in the 1968 Yearbook in some detail, and briefly referred to at the beginning of this article. Since the flowers are about the same size as those of the Senorita hybrid, and a salmon orange in color, some attractive pastel colors should emerge from this cross. He would also like to cross his new ruffled red miniature with the Senorita hybrid, but that will have to be a goal for next year. Anticipation is the motive for perseverance!

AN AMARYLLIS BREEDING PROJECT—1968 REPORT

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This report will be devoted to (1) amaryllis hybrids and species which bloomed for the first time in 1968 and a few notes in regard to progress in hybridizing, and (2) some comments on cultural practices in growing the species and hybrids.

1968 BLOOM SEASON AND HYBRIDIZING EFFORT

Six seedlings having the parentage SA 63-20 X (*A. evansiae* x *A. aglaiae*) bloomed in January and February, 1968. This cross was made in 1965 and the pod parent, one of Mr. Goedert's unidentified imports, has been described previously (PLANT LIFE, 1967, 1968). Of these six seedlings, four were very similar to the pod parent. Each bore one scape carrying two florets, medium pink in color, with form and markings very similar to SA 63-20. A fifth seedling made two scapes, one four flowered and one three flowered. These flowers were near white with a very slight pink flush. Unfortunately the flowers were not long-lasting and the substance left a lot to be desired. The sixth and best seedling was a delightful miniature with good substance and the most delicate light pink coloring. The single scape was two flowered. Even if no other good plants result from the 20 or more seedlings remaining to bloom, this one was worth all the effort of growing these seedlings.

This group of seedlings appears to have inherited the most outstanding characteristic of the SA 63-20 parent—a high degree of fertility. All attempted pollinations were successful. Most noteworthy was the pollination of the best pink miniature with 'White Christmas' and with *A. fragrantissima*. Pollen from *A. fragrantissima* was generously supplied by Fred Buchmann who bloomed this beautiful long trumpet species in 1968 and who reports on it in this issue. Although a good batch of seed was obtained from the cross with 'White Christmas', only two seedlings resulted. This experience parallels very closely the results of a 1967 cross in which 'White Christmas' was the pollen parent with (*A. evansiae* x *A. aglaiae*) x *A. evansiae*. This cross also gave only two seedlings from 50 or more seed. It may or may not be coincidental that 'White Christmas' was the pollen parent in both cases. Several dozen seedlings resulted from the pollination with *A. fragrantissima*. These seedlings appear to be very vigorous growers; at this writing they are only 6 months old and are already 6-8 inches tall. The potential for obtaining long trumpet or semi-trumpet vigorous hybrids in pastel pink or cream colors is most interesting.

Speaking of trumpet flowered amaryllis, the writer was fortunate to obtain a small bulb of *A. viridiflora*. This bulb was sent by Dr. Cardenas to Prof. Claude Davis. When obtained in the fall of 1967 the one inch diameter bulb was potted in a 3 inch pot. It remained completely dormant until May, 1968, at which time it sent up a bloom scape. The scape was two-flowered and the blooms opened late in May. These

blooms appeared to agree very closely with the description of *A. viridiflora* given in the AMARYLLIS MANUAL except that all of the dimensions were very much smaller than those quoted. The scape was two inches tall, the flower length 3½ inches, tube length 2½ inches, and diameter across the face of the flower 1½ inches. This miniature size probably is a reflection of the very small size of the bulb. There is little doubt that this is the true *A. viridiflora*. Unfortunately, because of the very late period of bloom, there were no other amaryllis hybrids or species on which to use the pollen of *A. viridiflora*. So an attempt is being made to preserve this pollen for an entire season by dry freezing. It will be used during the 1969 bloom season on hybrids and species which are known to be good seed setters.

To produce yellow or near yellow hybrids in various forms and sizes remains a noteworthy objective. Many amaryllis enthusiasts think in terms of large-flowered yellow hybrids of leopoldii form. Still, there is much to be said in favor of the smaller flowered yellow hybrids. At the spring, 1968 meeting of the Louisiana Society for Horticultural Research held at the University of Southwest Louisiana, there was in flower in the greenhouse a most beautiful small yellow hybrid from the breeding efforts of the late Prof. Ira S. Nelson. This hybrid was of an iridescent buff-yellow color, very full in form, but only about 3½ inches across. The parentage was *A. evansiae* x *A. aglaiae*. To say the least, this hybrid "stole the show" from many larger and unusual hybrids. This served to reinforce the efforts which this writer is devoting to breeding two lines of small yellow hybrids. One line is to be predominantly *A. aglaiae* with a small amount of *A. evansiae*, and the other line predominantly *A. evansiae* with a small amount of *A. aglaiae*. It is believed that both lines will be more vigorous and easier to grow than either of the species. It should also be possible to segregate form and color variations. The program was started in 1967 with a cross of *(A. evansiae* x *A. aglaiae)* x *A. evansiae)* X *(A. evansiae* x *A. aglaiae)* and was continued in 1968 with a cross of [*(A. evansiae* x *A. aglaiae)* x *A. evansiae*] X *A. evansiae*. Even though both groups of seedlings are quite small it is easy to detect significant differences in foliage characteristics.

A limited amount of breeding stock having potential for producing large-flowered yellow hybrids is gradually becoming available. One of the two seedlings having the parentage [*(A. evansiae* x *A. aglaiae)* x *A. evansiae*] X 'White Christmas' is showing excellent growth and has made a few offsets. Mrs. Herbert Kelley has given the writer two seedlings derived from 'Chastity' (white from India) X *A. evansiae*. Dr. Traub has kindly furnished some seedlings derived from 'White Crane' X *A. aglaiae*. Most of this stock is at least two years from bloom.

CULTURAL PRACTICES WITH AMARYLLIS SPECIES

After about 10 years of experimentation in growing amaryllis species and closely related hybrids, this writer has progressed to the point where losses by rotting of the bulbs are infrequent. Most recent losses have resulted from excessive watering of bulbs in a weakened

condition due to having matured seed pods. It is therefore appropriate to pass along to others interested in growing species those observations which are felt to be most important.

All the observations can be put in the form of two rules (1) pay strict attention to all facets of the potting operation, and (2) water very sparingly or not at all during the period of dormancy or semi-dormancy.

The most critical features of the potting operation are (1) pot size and (2) potting medium. It is a serious mistake to pot a small bulb in a large pot. For bulbs less than one inch in diameter the writer uses a two-inch pot; for bulbs 1-1½ inch in diameter a 3 inch pot is used, and for larger bulbs a pot not more than 1½-2½ inches larger in diameter than the diameter of the bulb. Clay pots are used in preference to plastic pots. For the past year experimentation has been underway on use of the foamed polystyrene drinking cups for potting small (one year old) seedlings. These cups are about 2½ inches in diameter at the top, about 3 inches deep and are quite inexpensive. Two triangular shaped drainage holes are cut in the sides at the bottom; the cup is filled to a depth of about ¾ inch with small pea gravel before adding the potting medium. In addition to economy, these plastic cups will not allow the medium to dry out as fast as clay pots and it is therefore not necessary to sink the cups in soil or any other medium to prevent rapid drying out. The results to date (8 month test) with these plastic cups are very promising, but longer term testing will be necessary before they can be fully recommended.

A high porosity potting medium capable of perfect drainage and good root aeration is essential to success in growing amaryllis species. The potting medium currently being used by the writer is as follows:

COMPONENT	PARTS (VOLUME)
Good grade of potting soil	2
Vermiculite (Agricultural grade)	2
Coarse sand	1
Dehydrated manure	1
Steamed bone meal or oyster shell flour	½

The components are mixed thoroughly in a suitable container. This potting mixture has been in use for two seasons and has performed well; it gives excellent porosity and drainage. Note that use of peat moss is avoided. Peat moss results in excessive sogginess and is felt to have contributed to much of the bulb rot experienced in earlier years.

As already mentioned, small clay pots dry out very rapidly in the 95° summertime temperatures in this location. Daily watering is a virtual necessity. Sinking the pots in our heavy clay soil is undesirable because of poor drainage during periods of excess rainfall. To overcome this problem the pots are set on the ground and the space around the pots is filled with a mulching material such as sugar cane bagasse, pine straw or leaves. An alternate method is to set the pots in old fruit crates and completely fill the areas between the pots with the mulching material. Six to fifteen pots can be set in a single crate and this makes for easy portability. When the clay pots are protected in this manner, watering every 3-4 days is sufficient.

All of the *Amaryllis* species and hybrids go into a period of rest after having made a season's growth and prior to blooming. This rest period varies from a cessation of growth as in *A. evansiae* to complete dormancy as in *A. cybister*. It is during this period, which normally occurs during the fall and winter, that great care must be taken not to over water. If water is withheld entirely the worst that can happen is for the plant to go completely dormant. Too much water is almost certain to cause rot with many species and hybrids.

HYBRID VIGOR IN AMARYLLIS

J. T. Schmidt,

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For the past fifty years our gardens have contained many *Amaryllis* clones. When Dutch bulbs became available after World War II, a breeding program was undertaken. Mature bulbs were dug in early September, put in cold storage for five weeks at 55° temperature with humidity controlled (PLANT LIFE, 1954), and the blooming period began at Thanksgiving with pollinating and seed maturing at an early date. This coincided with the arrival of new improved bulbs from Holland and new pollen and pod plants.

In retrospect, for the past decade much of the successes resulted from the advice and path led by a gentle, knowledgeable man, Prof. Claude Davis, who distributed Dutch clones and species collected by Dr. Martin Cardenas and the late Dr. Ira Nelson.

A whole new horizon opened with Dr. Ira Nelson's contribution including species collected in South America in 1954 and 1958 and made available with their hybrids through The Louisiana Society For Horticultural Research. His belief and encouragement centered on obtaining vigor through hybridizing species with seedlings more adaptable to outdoor cultures in Southern gardens.

The following crosses have been made: *A. evansiae* X 'Nivalis'; *A. evansiae* X 'Maria Goretti'; *A. evansiae* X 'Christmas Gift'; *A. evansiae* X *A. aglaieae* X *A. evansiae* X 'Nivalis'.

The yellow hybrid known as 'Morris Yellow' (PLANT LIFE, 1968) was used as the pollen plant on the above white Dutch clones. Similar crosses were made using *A. evansiae* pollen on 'Picotee'.

A similar program was followed in using *A. evansiae* and 'Senorita' pollen on some of the pinks such as 'Flora Queen' and 'Dutch Belle' which resulted in new hybrids of beautiful pink florets similar to 'Fairyland' bearing four florets to the scape of 7½ inches in size.

The growing and hybridizing of *Amaryllis* species and hybrids as influenced by Dr. Ira Nelson and others has resulted in Louisiana, especially in the Baton Rouge area, of new and different types of flowers as reported by Fred J. Buchmann and Joe K. Mertzweiller (PLANT LIFE, 1968). One other grower, Mrs. T. K. McKnight, has thousands of *Amaryllis* growing outdoors year round with plants of *A. striata* crosses showing exceptional vigor and numerous off sets.

During the severely cold winters here in 1962, 1963, and 1964, we experienced temperatures as low as 9°. These hybrids survived with pine straw or bagasse mulching.

This past spring we obtained from the hot houses at the University of Southwestern Louisiana *Amaryllis* pollen of *A. evansiae* type, pink hybrid type, etc. and used this on corresponding large Dutch clones and large whites and 'Picotee' flowers. The result was almost 100% in setting seed. At this writing the seedlings now are growing vigorously showing at least three leaves on a nice size bulblet.

There has been a considerable exchange of plants and pollen this past season, and several hard to obtain species, *A. yungacensis*, *A. forgetii*, and *A. pardina* were received from Dr. Martin Cardenas of Bolivia and distributed by Prof. Claude Davis. This will certainly help increase the interest in species and hybrids in this area.

Some notes on growing are: Work the topsoil with rotillers. Then railroad cross ties are used as retaining wall material to allow a top fill of six to eight inches of mixed peat-moss, manure, and coarse sand. This allows the seedlings to be high and dry. Plants are watered when rain is absent and liquid feed is given every three weeks. Species are put (in their pots) in similar beds shaded by pine trees. Shaded plants bring better flowers next season. All potted species are returned to a heated hot house in November before the first frost and "put on the wagon" with very little water till the next scapes appear.

One fringe benefit in our search for pollen and species is the new friends we've made who have helped generously in so many ways.

PLATYASTER AND STENASTER CROSSED WITH CODONOCRINUM

L. S. Hannibal, *4008 Villa Court, Fair Oaks, Calif. 95628*

Dean William Herbert reported several crosses between *Crinum* species which are placed in different subgenera. Surprisingly he found several of the hybrids fertile and raised second generation hybrids. Recently, with the cooperation of Mrs. Grace Hinshaw, Thaddeus Howard and Charles Harris the writer had occasion to examine a number of these plants and repeat some of the crosses. Nearly all of the combinations have been found hardy, free flowering and fertile. We submit the following comments:

The first *Platyaster* x *Codonocrinum* cross which came to our attention was Elizabeth Lawrence's 'Miss Elsie', a *Crinum americanum robustum* x *bulbispermum alba* cross (see Plant Life 1962, pg. 90) which we have repeated. It is an old and very common garden plant in South Carolina, as it is extremely hardy. It sometimes sets seed, but the pollen is quite viable. A sibling cross of smaller stature is 'Seven Sisters'. It occurs where *C. americanum* is the seed parent. Thad Howard has backcrossed 'Seven Sisters' onto a broad petaled *bulbispermum alba*. The

resulting hybrid 'Ollene' produces blossoms with the erect patent features of *C. americanum* although the tepalsegs are nearly elliptical. Unquestionably 'Miss Elsie' and 'Seven Sisters' are promising breeders.

A cross known as 'Martha Washington' appears to be *C. americanum* by *C. powelli albaum* (The latter has very viable pollen, try it.) 'Martha Washington' has wider tetalsegs than 'Miss Elsie'. As the name indicates it is snow white. *Crinum* 'Catherine' is smaller in stature than the others above and as it produces semi-elliptical tepalsegs the feeling is that it is *C. americanum* by *C. giganteum* (*C. jagus* according to Hortus III). The blossoms are distinctly intermediate between these two species.

The first colored *C. americanum* hybrid to be encountered was Mrs. Hinshaw's 'Elina'. *Crinum* 'Cecil Houdyshel' was the pollen parent. The blossoms resemble a small pink peony with slender elliptical tepalsegs. Recently the writer flowered a richly colored *C.* x *digweedi* Herbert, a cross of *C. americanum* x *C. scabrum*. The blossoms are a vivid Chinese red to pink on the exterior; the interior of the tepalsegs are keeled a warm rose pink. The scape is a rust red-brown. It is one of the most striking hybrids grown in Florida (*C. submersum* Herbert excluded) and excepting for the few blossoms and spreading filaments would readily be taken for *C. amabile*, or *C. erubescens*. However the foliage fits neither.

Although the writer has produced many siblings of *Crinum* 'H. J. Elwes' *(americanum* x *moorei)* none appear willing to flower, thus we cannot report upon the viability or floral pattern, but with the exception of the *C. moorei* crosses which contribute a rosette of leaves not unlike *C. moorei* all of the other *C. americanum* hybrids have strap-like or slender tapering semierect leaves. Similarly, all have 5 to 8 semierect blossoms with patent or flat ray-like tepalsegs which are about $^3/_4$th inch wide by $2^1/_2$ to $3^1/_2$ inches long. These are oblong or elliptical in shape, not lanceolate. The pollen is always a deep golden yellow and most crosses exhibit a fragrant vanilla type odor.

In contrast the *Stenaster* x *Codonocrinum* hybrids have 12 to 25 slender, erect trumpet shaped blossoms and succulent, long tapering, semi-erect leaves. *Crinum* x *eboraci* Herbert is the type form but the writer has worked mostly with the clone 'June Harris' which is a cross of *C. asiaticum* x *bulbispermum roseum*. This pink flowered plant sets seed occasionally and the pollen is quite potent. Backcrosses onto the red flowered Kimberley *C. bulbispermum* are particularly vigorous seedlings.

Crinum x *eboraci* 'Zimmermann' is an *asiaticum* cross by *powelli album*. The clone may be lost to horticulture, but it was reported as fertile. Mrs. Hinshaw has a similar cross using 'Cecil Houdyshel' as pollen donor. The 'Twelve Apostles' group appear to belong to the *C.* x *eboraci*. This hybrid is slightly smaller in stature. The blossoms are brick pink which suggests a colored parent like *C. scabrum*. All variants have been found sterile.

The writer has crossed the dwarf *C. asiaticum* var *japonicum* and several forms of *C. pedunculatum* with various *Crinum* species and

hybrids. Some show vigorous growth, others like the *C. moorei* crosses make a feeble effort. According to Herbert, his *pedunculatum-bulbispermum* hybrids were vigorous and freely viable. The writer can confirm the vigor, but the plants are still too small to flower.

As stated, all of the *Codonocrinum* x *Stenaster* crosses carry umbels with 12 to 20 or more blossoms which are slender erect trumpets in form. The flowers are not as showy or attractive as the patent shaped *Platycaster* hybrids. As far as the succulent upright foliage is concerned, it is rather unique in that it resembles that of an *Agave*. There is no known counterpart amongst the Crinum species which makes these hybrids easy to recognize.

With the exception of 'Twelve Apostles' all of the bi-subgeneric crosses listed above are fertile. The same appears to apply to other known hybrids of the same general type. There may be instances where seed may not form, or it aborts, but when pollen strikes without difficulty we consider the hybrid viable. Perhaps we should say "pollen viable". Because all of the above crosses involve remotely related species, the ability to be fertile is striking, particularly when one considers that hybrids between the *Codonocrinum* alone are nearly 50% sterile. In other words why should closely related or allied species give sterile hybrids and those remotely related fertile hybrids? In fact we are finding many of the wide crosses to be the most striking hybrids and we would certainly encourage the use of *C. americanum*, *erubescens* and *amoenum* with *scabrum*, the red flowered *bulbispermum* from Kimberley or *C.* x *grandiflorum* Deleuil.

AMARYLLIS EVANSIAE, MY INSPIRATION AND CHALLENGE

Mrs. Alek Korsakoff, *7634 Oriole St., Jacksonville, Florida 32208*

It all started several years ago. . . . Dreams of a large, flat, green or yellow hybrid. . . .

My first *Amaryllis evansiae* was obtained from Mr. Wyndham Hayward, a large, nice bulb. It bloomed and I made an *A. belladonna* ♀ x. *A evansiae* ♂ cross. Result—not a large yellow or green hybrid but a small one I am pleased to have; one flowering in a 4-inch pot with two scapes to the bulb, four florets in the umbel.

Later I obtained tiny seedlings of *Amaryllis evansiae* from Prof. Claude Davis and coaxed one to maturity meantime losing Hayward's bulb but saving one of the offsets.

When I married Alek he contributed his two *Amaryllis evansiae* (K 730 from Davis and K 788 from Fairchild Tropical Garden). Later he received *A. evansiae* forma *flavescens* (PIM-13724), a very strong grower, and numbered it K 1068. K 1117 and K 1120 were given to my two clones.

In 1965 all bulbs flowered at the same time and pollen from K 1068 was used on K 788, K 1117 and K 1120. K 1068 was also pollinated.

Seeds ripened and were duly planted in very sandy soil with a little humus. When the seedlings produced the second leaf, I started watering twice a month with a solution of ½ teaspoon of "Hyponex" to a gallon of water; later changing to a teaspoon of "Hi-Gro" to a gallon of water.

In due time the seedlings were potted in a mixture of sand, humus and perlite and checked for perfect drainage. Seeds and seedlings of *Amaryllis pardina* that ripened at the same time were treated in the same way, and are doing well. All are grown under roof to control watering, with plenty of light, and are watered sparingly until they lose their leaves. Then, until new growth appears, they get only one watering a month.

When potting the smallest seedlings, I plant then in 2-inch pots in sphagnum and perlite to save space. They grew and grew out of the pots, and believe it or not, *A. evansiae* bloomed with as large scapes and flowers as their siblings in the 4-inch pots. If a bulb begins to rot, I clean and disinfect it and re-root it in sphagnum and perlite. The re-rooted bulbs grow in this medium so fast and fill the pots with offsets, and the offsets and mother bulb bloom in the same 4-inch pot.

This year (1968), my bench was full of *A. evansiae* flowers of all sizes, shapes and colors, tailored and ruffled. *A. pardina* seedlings did not bloom yet. When *A. cybister* opened its octopus flowers, I used its pollen on the narrowest and longest segmented flowers of *A. evansiae*. The capsules are swelling—intriguing anticipation. . . .

I have also crossed the greenest *A. evansiae* seedlings with most green siblings, and the yellowest with the most yellow. I have selected a very wide and wavy segmented ivory colored one, and the palest one with a beautiful pink star in the throat.

All of these are so beautiful and really not hard to grow after one learns to keep them happy.

I hope my seedlings of *A. pardina* will be as diversified as the *A. evansiae* are; and have many different shades of background for the lines and dots.

POSTSCRIPT.—A quote from a friend's letter in Miami: "We went to . . . last week to see if there were any *Euphorbia lophogona* Lam. there. . . . However, I did see the clump of *A. evansiae* which George ..... had discovered there a couple of years ago. It is not, surprising that they survive? Perhaps, the fact that they were forgotten and neglected is the answer. They are planted against a south greenhouse wall. The ground there is slightly raised and not only are the bulbs crowded because they have multiplied but they are also hemmed-in by other species of *Amaryllis*. I am sure they are never watered except when nature supplies it. They were not yet in bloom—only a few showed buds as yet. It is interesting to note, though, that they were all smaller than Mrs. K's—lack of fertilizer perhaps."—*Alek Korsakoff*

PLANT LIFE LIBRARY—continued from page 76.

LANDSCAPING FOR WESTERN LIVING, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 160. Illus. $2.95. This completely revised and up-dated profusely illustrated edition of a most popular aid to home gardeners in the Western States, will be welcomed. The topics discussed include the Western approach to home landscaping; effective landscape planning; gardens for dedicated and casual gardeners; remodeling an established garden; plans for hillsides and sloping lots; the garden as an outdoor room; and planting for a purpose. Highly recommended to all gardeners.

IDEAS FOR JAPANESE GARDENS, by the Sunset Editors and Jack McDowell. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 160. $2.95. The purpose of this excellent and profusely illustrated book is to provide ideas for an entirely new Japanese garden, or the modification of an existing garden with an Oriental touch. The topics discussed include the nature of the Japanese garden; the stability of stone; how to use plants; water creates new dimensions; paths and walks; how to enclose the garden; structures and details; Japanese ideas that work; and plans to get you started. This attractive book is highly recommended to all gardeners.

HOW TO GROW HOUSE PLANTS, by the Sunset Editors, and Barbara Pesch. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 96. Illus. $1.95. This very attractive and profusely illustrated handbook will be welcomed by indoor gardeners. The topics discussed include an introduction to indoor gardening; plants for foliage and blossoms; African violets; indoor-outdoor plants; succulents and cactus; bromeliads; orchids; pests and diseases; fluorescent light gardening; and year-around gardening. Required reading for all indoor gardeners.

HOW TO GROW AND USE CAMELLIAS, by the Sunset Editors, and an introduction by D. L. Feathers. Sunset Books, Menlo Park, Calif. 94025. 1968. Pp. 80. Illus. $1.95. This is an up-dated, profusely illustrated, practical guide to the use of camellias in western landscaping. The topics discussed include choosing quality camellias; how to plant and care for camellias; Bonasi; landscaping with camellias; propagation; corsages; and a camellia encyclopedia. Highly recommended to all gardeners.

HOW TO GROW BULBS, 2nd revised edition, by the Sunset Editors. Lane Books, Menlo Park, Calif. 94025. 1968. Pp. 96. Illus. $1.95. This book is dedicated to gardeners who want to know more about bulbous plants, including the scientific and common names. The topics discussed include the techniques of bulb culture; container culture; how to combine bulbs; flower arrangements; ten most popular bulbs; and encyclopedia of bulbs; pronunciation guide, and seasonal calendar. To this list the following bulbs should be added for California. **Rhodophiala, Eustephia, Chlidanthus, Calostemma, Eurycles**, etc. (see Traub, the Genera of Amaryllidaceae, 1963). This stimulating book is highly recommended to all gardeners.

EASY GARDENING WITH DROUGHT-RESISTANT PLANTS, by Arno and Irene Nehrling. Hearthside Press, 381 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 320. Illus. $6.95. This beautiful, profusely illustrated book on gardening with plants that require a minimum of water fills a definite need. The topics discussed include, why a book on dry gardens?; designing drought-resistant gardens; soil improvement and garden maintenance; hardy trees; hardy shrubs, ground covers and vines; drought resistant annuals and perennials; desert flora; plants for container gardens; and conservation is everyone's problem. Highly recommended to all gardeners.

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4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

PLANTING, FERTILIZING AND CARING FOR AMARYLLIS GROWN OUTDOORS

HENRY VAN WOESIK, *President-Director,*
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1. TREATMENT ON ARRIVAL

Abrupt changes in temperature may occasion Amaryllis bulbs to start sweating in transit, so that they may arrive with some red spots, rot or moisture, around the neck in particular; rub the blubs clean with sand, then apply DURA DUST (50% D T T) but not on the roots, put them aside in a cool place for approximately 48 hours, allowing them to dry and then plant them.

Of course, you may cut away any rotten part of the scales, or wash the bulbs clean under a running water faucet, using your hand to twist off the rot, but such treatment should only be applied when the bulbs should arrive in very bad shape, so that it will only be necessary in very exceptional cases.

If something bad should actually have happened to the bulbs in transit, send in your claim to the suppliers, as the bulbs have been insured against all possible risks and dangers. When receiving bulbs without roots, use a rooting medium around the foot or at the basal plate as some say; if this is done when planting, it will help a great deal.

2. REMOVAL OF ROOTS

It is extremely important for Amaryllis bulbs to keep their roots. Of course, some suppliers from other parts of the world, where Amaryllis are grown in the open (great changes in temperature between day and night may easily cause Amaryllis bulbs to lose their roots), have great difficulties in getting well-rooted bulbs, so that they cut off what few roots the bulbs have, asserting that Amaryllis should develop new roots every year. Only the latter part of their assertion is true, for the Amaryllis bulbs should flower on their old roots, after which they should develop new roots; the two or three scapes take a lot of substance out of the bulb, but less, if the bulb is helped by the old roots. So only cut off the dried-up parts of the roots and the roots that have entirely shriveled up, but leave the good, healthy and strong roots alone.

3. REMOVAL OF SCAPES

Some people remove the first scapes that appear to give the bulbs a better change to survive and to acclimate; this is not necessary at all, if the bulbs are well-rooted.

4. ROOTING

As stated above Amaryllis bulbs should develop new roots every year again after they have done flowering; if the old roots are still on the bulbs, when they are planted, the flowering process will take less substance out of the bulbs, which should afterwards be well-fed to help them develop new roots and new substance. (often Amaryllis bulbs feel like sponges, when they have flowered).

5. PREPARATION OF AMARYLLIS BED

Remove completely 14″ of the existing soil; then fill the open space with soil preparation as listed below and bring the top of the bed 4″ above the surrounding garden area. By doing so, you will ensure good drainage at the same time provide 18″ of proper soil to grow the Amaryllis in. This bed preparation is a "MUST" to have success in growing Amaryllis in the open ground.

6. SOIL PREPARATION (MIXTURE) FOR ABOVE BED

⅓ Leaf mold (preferably of two years old beech leaves, but at any rate a mixture that has a pH of approximately 6/7, though the pH may be reduced by pure sphagnum peat moss, see below).

⅓ Sharp sand (the same as concrete sand).

⅓ Pure Sphagnum Peat Moss; to which mixture you may add 15 Pounds of Bone Meal for every 25 square feet.

REMARK I: *Pure Sphagnum Peat Moss.* (hydrated . . . 98% Organic—pH 3.5). A good product of Canadian origin and ideal to get down the pH, which is generally too high, is said to be imported by WESTERN PEAT CO., 5800 Monroe Street, SYLVANA - Ohio and your dealer could no doubt get it for you.

REMARK II: *Leaf mold.* The use of leaf mold found close to the coast is somewhat dangerous, due to the presence of salt caused by high water during hurricanes.

REMARK III: *Sharp sand* (concrete sand) is bountiful locally and has been washed, so there is no danger of salt.

REMARK IV: *For growing in pots:* ½ Leaf Mold; ½ Pure Sphagnum Peat Moss; a handful of Bone Meal for an 8″ pot.

7. WATERING

No overhead watering (especially not, when Amaryllis are in full bloom), except occasionally to get dust from leaves, if there has been no rain for some time, in which case a light mist spray is better.

It is always desirable to soak the bed in the late afternoon, as the *alkalinity* of the water is likely not to be so great that time of day, due to heavy use during the day.

The water supply is usually heavily treated with *chlorine* and with late day watering, this does not seem so strong. So you had better not water during the hottest part of the day (between 10 A.M. and 4 P.M.); as the sun rays are very intense during these hours, foliage damage may occur, if watering is done during these hours.

REMARK: Potted Amaryllis should be watered from underneath, placing the pot in a container until the top soil becomes wet. Regular watering always gives better results, never allowing bed or pot to become entirely dry.

8. SPRAYING

In early spring, when the bulbs start developing new foliage, spray with an insecticide or disinfectant (as strong as the local authorities allow you) to kill off as many insects as possible, for insects spread Mosaic Virus.

Spraying is of vital importance, when you spot *aphids* (greenflies or plantlice), in which case spraying will be necessary on a fortnight's schedule, as the disinfectant will kill the aphids, but not their eggs. For safety's sake the spraying may be recommended to be repeated five times; it will make your yard a pleasanter place to be in, for most insects do not just bother Amaryllis plants.

9. MOZAIC VIRUS

Plants suffering from the disease, should be removed relentlessly, as there is no cure possible; if they are overlooked, the insects will spread the disease, and all your valuable Amaryllis plants will soon be infested.

10. FERTILIZING

Fertilizing should also be done on a schedule. Fertilize each one with *OIL EMULSION* (containing fish oil) or *LIQUID SHEEP, COW or HORSE MANURE*.

This feeding along with the Bone Meal already added to the above mixture will be sufficient for the growing months.

The beds should also be kept mulched all during the growing season until time to lift the bulbs in late fall. Foliage feeding, often applied to Lilies, is not necessary at all, if you fertilize in the above way.

11. LIFTING

Lift your Amaryllis bulbs in late fall for a rest, which will greatly stimulate the flower development within the bulbs; putting the roots in Sphagnum in large boxes with plenty of holes for air circulation; stacking them in a dry place. Though this implies a lot of work, it will give better results in my opinion, the more so as you have a chance once a year to do something about the Amaryllis beds. The soil should be refreshed once in two or three years at least, for the roots of Amaryllis plants infest the soil; sterilization or fumigation of the soil would be the solution, but wherever not possible, the soil should be replaced by fresh soil once in a while.

If you do not lift your Amaryllis bulbs, giving them a six weeks' rest, you should mulch them well to protect them from cold weather; some Amaryllis-lovers lost thousands of Amaryllis in one cold night. Lifting your bulbs has one more advantage, viz., the opportunity to check them for RED FUNGUS; if they suffer from the disease, clean

them thoroughly, rubbing the red off with sand, applying a fungicide and drying them well.

SOME USES FOR SYSTEMIC PESTICIDES ON AMARYLLIDS

JOHN M. CAGE, *1501 Page Mill Road, Palo Alto, Calif. 94304*

For two years I have been experimenting with the use of systemic insecticides on amaryllids, particularly hybrid *Amaryllis*. Several hundred seedlings and mature plants are grown both outdoors and in a small greenhouse. These systemic poisons, which function by being absorbed and distributed in plant tissues, as well as by contact, have been very effective under several conditions. *With proper precautions against poisoning*, they are definitely useful to the amateur gardener.

My first experience was with Scope (no longer available) and Cygon CE-2, used as a foliage spray on plants outdoors. The active ingredient in Cygon is *O, O-dimethyl S-(N-methylcarbamamoylmethy) phosphorodithioate*, or *dimethoate* for short. I found this spray treatment very lethal to thrips, aphids, and spider mites. The long residual action permits the spray schedule to be simplified to about one treatment per month.

However, foliage sprays with systemics do not solve two very important insect problems. First, I consider the material *far too toxic for use indoors as a spray*, and second, foliage treatment has not controlled several serious infestations of plant roots.

About two years ago, an invasion of an extremely obstinate thrip-like insect came in, apparently on purchased bulbs. This insect, which looks like a microscopic gray fly that does not fly, was associated with a root-lesion nematode, or some similar microscopic worm. Either the worm is the larva of the insect, or they seem to support each other symbiotically. The worms gradually destroy the root system and basal plate of *Amaryllis*, *Sprekelia*, *Narcissus*, *Zephyranthes*, and other bulbs. A strong magnifying glass is required to see either invader.

I should have obtained professional identification of the pest, or pests, but my first thought was to eradicate the trouble quickly. Fortunately, I was successful and have no specimens left for identification. The successful treatment consisted of *soaking bulbs* in a dieldrin solution (1 teaspoon of 28 percent emulsible solution per gallon of water) for about an hour and a *soil drench* of systemics after roots start.

Once roots have been destroyed and nematodes have burrowed into basal plates, the soil drench seems to be ineffective. Bulbs must be cleaned and soaked in the dieldrin solution or a systemic solution before replanting. Soaking in a solution of one teaspoon of Cygon CE-2 per gallon of water for several hours seems to rid the bulb of nematodes, as does dieldrin.

After a new root system has been established, the best control treatment I have found is systemic granules watered into the growing

medium. Several firms sell 2% granules of Di-Syston, a chemical similar to the one mentioned at the beginning of the article, including Green Light and Ortho. Used at the rate of one level teaspoonful per six-inch pot every two months, this material has kept plants clear of all insects, both on leaves and roots. When plants are free of pests, dosage can be reduced. Toxicity to the plants has not been serious, except on some Crinums.

I found an even more effective systemic pesticide to be phorate, again similar to the compound mentioned above. It is so toxic to humans that it is apparently not sold for amateur usage, but I should think it could be profitably employed by the large-scale growers. It is used widely by the commercial lily growers in the Northwest. Because of my chemistry background, a few pounds of Thimet, a version of the chemical made by American Chemical Company, were made available to me for testing. I received the 10 percent granules, and only about ¼ teaspoon per six-inch pot is sufficient. Mites, slugs, white flies, mealybugs, and caterpillers were controlled, as well as the nematode pest described above. The commercial growers should certainly consider this.

A very important side effect of systemic pesticides is the retarding of the spread of virus diseases. For over a year I have kept virus-infected *Amaryllis* plants (too valuable to destroy) in the same greenhouse with healthy plants without further spread of the infection. It is probably sufficient to treat only the infected plants.

Let me emphasize: *these materials are deadly poisons*, by swallowing, absorption through the skin, and breathing of fumes. Irrigation water dripping from a treated pot is one source of contamination.

Of other materials tried for prevention of root pests, nicotine was ineffective and lindane was less effective than dieldrin. Chlordane kills soil pests, but it has stunted *Amaryllis* growth everytime I have used it.

EXPERIENCES WITH AMARYLLIDS

Richard E. Tisch, *20516 Clark St., Woodland Hills, Calif. 91364*

General. Outdoors a home-made A-frame was discarded because its roof panels were too low for my tallest plants. Rather than replace it with a standard greenhouse, I purchased a relatively inexpensive "screen house". This is a set of 12 upright aluminum-framed plastic screen panels, hinged together to form a 6 ft. high 13-foot diameter circle—123 sq. ft. floor space. One panel acts as a door. A domed top framework of tubes (7½ ft. high) is covered with vinyl. The entirety is anchored to bolts secured in the patio concrete. This provides shade, protection from insects, fresh air circulation and a reduced range of temperature extremes for my potted seedlings, which are on patio-style redwood tables and benches. A hanging chemically treated killer of flying insects eliminates unwanted pests which get in under the edges of the panels.

Indoors my small plastic film covered "greenhouses", with thermostatically controlled bottom heat and timed Gro-Lux lamps, continue

to serve satisfactorily for starting seeds and bringing seedlings along to potting size. Flying insect killers hung inside these covered units control black flies.

Plants in plastic juice pitchers, when compared to those in standard clay pots or square plastic pots, continue to appear to have the strongest and healthiest leaf and root growth. So I changed from wooden seed flats to plastic dish pans approximately seven inches deep. Quarter inch drainage holes are drilled in the bottom. Over a layer of ¾-inch gravel and four inches of standard Amaryllis soil mix, the seeds are sown ½-inch deep in a two inch layer of Terralite. By spacing the seeds about two inches apart both ways, the seedlings can be left in the seed pans until their only and final shift into plastic pitchers, plastic pots or clay pots. This method seems to reduce time to flowering.

Amaryllis hybrids. When plants flower for the first time they are evaluated and either discarded or tried as pollen and/or seed parents. The following characteristics show pronounced differences: readiness to set seed, seed quantity and size, percentage of seeds which germinate, percentage of seedlings which have dark green leaves (versus pale green or albino), speed of early leaf growth, shape and size of leaves and bulbs, and root growth. During the winter of 1967 and the spring of 1968 the growth was generally less vigorous than usual, and the flowering season started later and ended sooner than usual; this year there were flowers only from 14 March to 6 May, with no winter or late summer flowering.

Amaryllis argilagae. Five bulblets, approximately ½-inch diameter, received in October 1966 from Dr. H. P. Traub, all have grown reluctantly. Only one has survived and is now in excellent condition under a Gro-Lux lamp indoors, with thermostatically controlled bottom heat. It likes moisture in the air, frequent watering and frequent feeding with weak fish fertilizer solution. Six leaves up to twelve inches long arch up from one to four inches over the rim of the plastic pitcher, the leaf tips drooping down from the horizontal to six inches below the pitcher's rim. Question: with that much droop, in their native habitat the leaf tips may be subject to rot unless soil drainage is very rapid, so how do they stand the high amounts of moisture the plant seems to require for best growth?

Amaryllis striata. There has been frequent year-round flowering indoors and outdoors. All are now outdoors in a bed with southeastern exposure. One plant is presently setting a seed pod resulting from a late June application of refrigerated pollen. Noticing that the leaves arch over flatly as described above for *A. argilagae,* I have watched them for rotting of the tips; it does occur, after the leaves have reached their prime condition and are beginning to decline.

Agapanthus. Both tall and dwarf blue, and tall white variations grow well in a southeastern exposure. While they will stand full sun and will flower readily so exposed, their leaf tips tend to dry out and the flowers fade more quickly. They set seed readily. Their requirements for food and water are not exacting; normal California weather conditions are suitable in almost all areas. This is a very popular plant here. I like the blue because it supplies a touch of cool color when it

is most needed, during June and July. The white provides an excellent contrast.

Allium unifolium. So far I have not determined its optimum growing conditions. One group in full sun and one in almost complete shade did not survive last year's summer and fall heat, followed by a cold wet winter. Many can be seen growing vigorously and flowering well in my neighborhood; but many have also died suddenly for no obvious reason.

Brunsvigia rosea. This is one of Southern California's most commonly-grown plants. It will survive total neglect, needing only our winter rains and our dry summers. From seedlings sown in December 1960, I have many bulbs which should flower this late summer. Some are in partial shade under a small *Albizzia* tree, and some are along a walk on the southeastern side of the house. The latter had more vigorous leaf growth which stayed green longer; they seem most likely to flower first.

Chlidanthus fragrans. From three bulbs potted in March 1965, there was one flower in April 1966 and none since. They were transplanted to a shaded coldframe and set eight to twelve inches deep. Foliage growth has been vigorous, but there is still no sign of flowering.

Chlidanthus x traubii. Eighteen seeds received in July 1967 from Dr. H. P. Traub were sowed in conditions normally used for Amaryllis seed. Germination was good in four days, with each seed lifted up out of the soil on top of a single round stem. True leaves started up in three weeks. Then they suddenly wilted and died. A check showed that the soil below the seed level was normally moist; no reason for the sudden wilting was apparent.

Clivia miniata. This is also a very common plant in Southern California, where it flourishes in deep shade, either in beds or in pots, provided the soil is rich. Flower stalks normally appear in February, but often decide to show up all spring and summer. Seeds are set readily; they germinate very slowly.

Habranthus andersonii var roseus. From a quantity of seed received in October 1966 from Dr. H. P. Traub, germination was excellent in a standard Amaryllis seedling condition. When transplanted outdoors, many died. The survivors are growing well in a shaded coldframe.

Haemanthus katherinae. Excellent growth and annual flowering in June in deep shade. The flowers are spectacular. In August and September "rusty" quarter-inch circles appear on the leaves, which by then are well chewed by worms, grasshoppers and cicadas. When the leaves are making their new growth in May, the center whorls are apparently especially tasty. The plant's habit of pushing new leaf tips right up through the old stalks is interesting to observe. Mine have not yet set seed for me.

Hemerocallis. Seeds have been taken from my two plants, one a deep chrome yellow-orange and one a delicate pale yellow. Germination indoors has not been satisfactory for me, but seeds have germinated well when sown ½-inch deep directly in the shaded coldframe. This is a popular plant in Southern California because it withstands neglect, once

established, and flowers freely under varying conditions of soil and exposure.

Hymenocallis narcissiflora. Several bulbs made fair growth in full sun, but did not survive a cold wet winter and two sharp frosts last February.

Lycoris squamigera. This is a very common plant in Southern California, where it produces leaves from February to June, then goes dormant, flowering with a naked scape in late July and August. Mine do very well in partial shade at the base of a small Olive tree.

Lycoris radiata. In a morning-sun-only exposure on top of a wall, mine grow leaves from November to June, then go dormant, flowering with naked scapes in late September. They have an excellent frilled shape, changing color from a terra cotta to a glowing deep crimson. Mine refuse to set seed.

Lycoris aurea. A grouping tucked under a Juniper tree's overhang, so they get only the early morning sunlight, have produced excellent leaf growth from late November to June, when they go dormant, flowering in mid October. While not very tall, mine have excited pleased reactions with their almost glowing deep yellow, frilled flowers. So far mine have not set seed.

Narcissus. I am still having fun with seedlings from 'King Alfred', 'Fortune' and 'Soleil d'Or'. Last February several more flowered for the first time; two of these will be kept as breeding stock. Seeds germinate readily when sown ½-inch deep in a shaded coldframe. After they flower, they are lifted and moved to a permanent location, where their ability to survive neglect is checked by leaving them in place the year around, watering them only when nearby plants are watered. Thus far, several have shown a tendency not only to survive but to thrive and multiply.

Nerine crispa (undulata?). In a southeastern exposure, mine have excellent leaf growth the year around. One plant surprised me by flowering last February. It had a brick-red flower on a twelve inch scape. The flower was small and delicate, being only one inch across. It would not set seed when selfed.

Rhodophiala x huntiana. Several seedlings are growing well in a shaded greenhouse. From seed received in October 1966 from Dr. H. P. Traub, I had excellent germination in the usual conditions supplied for Amaryllis seeds.

Sprekelia formosissima. This plant is commonly grown here, often in full sun. It grows best for me in a southeastern exposure, where its flowering is sporadic, likely to occur almost any time from April through October.

Tristagma uniflorum violaceum. These have continued to grow and flower with no attention in a raised pocket in full sun. Their blue color is welcome in mid-February, with yellow Narcissus nearby. Those I have in partial shade in a coldframe have larger, brighter flowers. All go completely dormant after producing seed copiously in May and June. Those in the shade restart leaf growth in late July; those in the sun, in September.

Tulbaghia fragrans. Some plants I secured from the stock of the late Cecil Houdyshel grow readily in either partial shade or full sun, but leaf tips yellow in the full sun. Growth is almost lush, but both leaves and flower stalks are loppier than *T. violaceae*. It tends to flower most during the shorter days of fall and spring, with a non-flowering stretch from March through September. Their fragrance is a pungent but fleeting sweetness, best enjoyed from cut flowers brought indoors to complete their opening.

Tulbaghia violaceae. The constant succession of flower stalks all summer, continuing at a slightly reduced rate over the winter, makes this a popular landscape specimen in Southern California. Their steady output of violet flowers offsets their garlic-like smell that is released even by a breeze's stirring their leaves. The growth habit is neat, with a solid clump that steadily increases in diameter. They like generous feedings, but withstand almost total neglect. Although they stop flowering for a while when transplanted or divided, food and water soon force them into renewed growth and flowering. One of my seedlings is smaller than standard; its leaves are six inches long and its flower stalks are twelve inches tall. It flowers steadily from a tight neat clump.

Zephyranthes citrina. These pleasing plants grow and flower well in semi shade. Seed are set without coaxing, and germination is excellent. To gather seed you'll have to compete with any mice that may locate the plants; if given a chance, they'll chew an entire clump to soil level. Seed pods start to split in sixteen to eighteen days from pollination; after fourteen days, I pick mine and put the stalk in water under a lamp to be sure of beating the birds to the seeds. Germination occurs in twelve to fourteen days.

BLUE AMARYLLIS FLOWERED IN SOUTH CAROLINA

CHARLES J. HUDSON, JR.

Curiosity in the blue amaryllis (*Worsleya rayneri*) finally paid off last fall when my plant came into full bloom, producing six perfectly formed flowers with slightly ruffled edges, and of a bluish-lilac color (Fig. 24).

The bulbs of this plant are curiously different from most other members of the amaryllis group, having a long neck of 14 inches. The long, arching strap-shaped leaves arise out of the top of the long neck. The plant now has reached a height of four feet and is still producing new sets of leaves to form a fountain-like effect.

Obtaining *Worsleya rayneri* from its native habitat in Brazil was a long, time consuming task, mostly in getting clearances from the U.S.D.A. and in going through the customary fumigation treatment before releasing the bulb in this country.

When the bulb was first received it was potted in a good soil mixture, the same as used for standard amaryllis bulbs. The plant was placed in a lightly shaded spot in the garden all summer, and was then brought into the greenhouse in the fall for flowering. No trouble was

encountered in the growing process since this plant thrived under the same general care given to amaryllis.

Mr. Harry Blossfeld, in a letter to me, dated January 6, 1968, indicated the difficulties of obtaining bulbs growing in their native habitats. He says, "They are huge things, and a man cannot carry more than two big ones or four medium sized specimens from the dangerous cliffs where they grow, down to the nearest road. That is a neck-breaking work, and you cannot make more than four trips a day, which

Fig. 24. The Blue Amaryllis, **Worsleya rayneri**, as flowered by Charles J. Hudson, Jr., in South Carolina.

means that a day's drudgery will produce a dozen bulbs. Then comes the red tape in shipping them, which will take a week running from one government office to the other to join a dozen distinct licenses necessary to ship live plants. And then comes the risk of fumigation treatment at Washington, D. C. in the U.S.D.A. bureau of Entomology".

From this information it is doubtful that *Worsleya rayneri* bulbs will ever be available in the United States at reasonable prices unless stock is built up from seedlings grown in this country.

GROWING **BRUNSVIGIA** x **PARKERI** IN LOUISIANA

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In midsummer of 1966, L. S. Hannibal sent me a collection of bulbs of *Brunsvigia* x *parkeri* W. Watson ex Traub. They were planted in my *Amaryllis* L. (syn. *Hippeastrum* Herb.) plot which is covered with shade cloth that allows 50% sunlight. Late that summer the bulbs put up flowering scapes and bloomed beautifully. The vegetative growth through the winter of 1966-67 was exceptionally good, but the bulbs gave practically no flowers in 1967.

Again, in the growing season of 1967-68, the bulbs grew exceptionally well, increasing in size and number. When the foliage died down in April of 1968, the bulbs were dug and stored in a dry place for the summer. They were replanted in August 15th and now, in mid-September, they are blooming exceptionally well.

It appears that *Brunsvigia* x *parkeri* must have a dry rest period during the summer months as is the case under natural conditions in the native habitat of the *Brunsvigis* parents in South Africa, where they do so well, and in California with a similar climate. My experience of one season is not necessarily conclusive, but it leads me to believe that *Brunsvigia* species and the hybrids such as *Brunsvigia* x *parkeri* may prove to be satisfactory for the humid Gulf Coast Region provided the bulbs are dug and given storage through the summer months.

Thus, by employing the summer bulb-storage method, the two Cape Belladonnas, the lower growing late-flowering, deeper pink, *Brunsvigia rosea* (Lam.) Hann. (see Plant Life 1963, p. 59); the taller early-flowering light pink species, *Brunsvigia major* Traub (see Plant Life 1963, p. 59), as well as the large number of hybrids in white, and many pink and red color shades and patterns grouped under *Brunsvigia* x *parkeri* W. Watson ex Traub, may be grown in the Gulf Coast Region. For a Comprehensive coverage of these last named hybrids see "Catalog of Brunsvigia Cultivars" by Traub & Hannibal, Plant Life 1960. pp. 39-62.

HARDINESS IN SOME **LYCORIS** SPECIES

NATHAN WILLIAM EASTERLY

Species of *Lycoris* are listed as semi-hardy bulbs in the trade catalogs. Nothing specific is given concerning the differences among the various species. My curiosity led me to plan an experiment to show differences in growth and hardiness among available species of *Lycoris*.

Two dozen bulbs were obtained of the following species: *Lycoris albiflora*, *Lycoris aurea*, *Lycoris "cinnabarina,"* *Lycoris incarnata*, *Lycoris radiata*, *Lycoris sanguinea*, and *Lycoris squamigera*. All bulbs were planted in 4 inch pots using a mixture of ½ soil, ¼ sand, and ¼ shredded peat. Six bulbs of each species were used as controls. Eighteen bulbs of each species were used as experimental plants.

The controls were grown in a small greenhouse (64 sq. ft.) at my home. The thermostat was set for 68 degrees F. during the day and 60 degrees F. during the night. The experimental pots were imbedded in soil of my bulb garden nearby with the rim of the pot at ground level. No protection of any kind was placed over the pots.

The experiment was run from October 1 to December 31, 1967. Three pots of each species were brought in every two weeks starting on October 21. The last of the bulbs were brought in on December 31. In the greenhouse the pots warmed up after a night in the warmer temperatures so I could make my observations of the plant's growth. The final observation on all pots in the greenhouse was made on February 15, 1968. I was looking for leaf production, first of all; next, the rate of leaf growth; and finally, frost damage or stunting of the leaves.

During October the day temperatures ranged from a high of 85° F. to a low of 45° F. The night temperatures ranged from a high of 66° F. to a low of 28° F. The day temperatures during November ranged from a high of 63° to a low 32° (two days). The night temperatures ranged from 54° to 16° F. Our major cold weather in November consisted of two days of 16° weather during the third week and two days of 18° weather during the fourth week. Although it snowed three times during the month, we had no ground cover of snow.

During the month of December the day temperatures ranged from 59° to 25° F. Seven day temperatures were below freezing. The night temperatures ranged from 41° to 3° F. Nineteen night temperatures were below freezing but only seven of these temperatures were below 20° F.

The results of the experiment are as follows:

Lycoris albiflora—All of the control plants grew vigorously from the start and produced many robust leaves. The experimental plants grew well from the beginning. The outside temperatures slowed up leaf production only slightly; no ill effects at all were caused by the 3° F.

Lycoris aurea—The control plants grew well but not as vigorously as *L. albiflora*. All of these plants were in good condition at the end of the experiment. The experimental plants grew well from the beginning but temperatures below 15° caused stunting. All of the plants, including the stunted ones, were growing well by February 15.

Lycoris "cinnabarina"—This plant is the poorest grower. Only two plants of the six produced any leaves at all and these leaves were dried up by February 15. The bulbs were saved to try again at a later date. The experimental plants produced different results. Pots brought into the greenhouse between November 15 (17° weather) and December 25 (26° weather) produced healthy plants with two or three leaves. Plants brought in before November 15 did not produce. Other plants were killed by the 9° weather on December 26.

Lycoris incarnata—The control plants were very slow in starting to produce leaves. During November the plants produced healthy leaves

but the plants died back by February 15. The experimental plants exhibited the same growth pattern as the controls. The cold temperatures had no effect on the plant's growth other than slowing up leaf production a little.

Lycoris radiata—The control plants grew slowly but steadily from the start. All plants produced leaves which were healthy on February 15. The experimental plants exhibited the same results as the controls. No ill effect, not even frost bite, was observed on any plant.

Lycoris sanguinea—The control plants took very long (November 15) to show leaves. After that, the plants grew very well, produced two to four leaves, and were healthy on February 15. The experimental plants never produced any leaves outside but started producing leaves after November 25 in the greenhouse. The cold temperatures stunted the plants' growth but the plants were growing slowly on February 15.

Lycoris squamigera—The control plants did not show leaves until December 10. The plants grew well after that and were producing many leaves by February 15. The experimental plants produced no leaves outside but started producing leaves in the greenhouse after December 10.

Only *Lycoris "cinnabarina"* was killed by cold temperatures (9° F. on December 26). All other bulbs were in good shape on February 15. My previous experience with *Lycoris sanguinea* showed that I could not leave the bulbs outside during January and February. Note that the growth of *Lycoris "cinnabarina"* was enhanced by temperatures that ranged from 17° to 38° F.

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AMARYLLID CULTURE IN SOUTHWESTERN LOUISIANA—A PRELIMINARY REPORT

William W. Zorbach

Prior to the writer's move from Kensington, Md. to New Iberia, La. in June of 1967, all of his amaryllids were dug, packed in boxes with vermiculite, and shipped to his present location with his household goods. Included in the shipment were all those bulbs that were handled in pots, as well as a number of live plants, which did remarkably well despite the fact that they spent twelve days in a hot moving van without attention.

The sedimentary soils of southern Louisiana appear to be very rich but, being sticky in nature, require a good deal of conditioning to permit adequate drainage. Accordingly, a bulb bed was prepared along the south wall of the writer's new residence, in which much sand and peat moss was added to the soil, permitting the level of the new soil to be

raised about 5" with respect to the yard. Plantings were made and because of the milder weather in Louisiana, the depths to which the bulbs have been set are considerably less than in the Washington area. In general, growth has been excellent, but soil fungus is a hazard, and few losses from this have been encountered.

It has been rather dismaying to find that a number of amaryllids which attracted much attention in the Washington area, are common garden plants here in New Iberia. This is true of the various hybrid crinums; "Ellen Bosanquet" appears to be the most common. It is of interest to note, however, that the gardeners in this area, who grow crinums, refer to them as "lilies", and it is my impression that they do not, for the most part, know the botanical names for many of the amaryllids grown here, which appear to be taken quite for granted.

Hymenocallis tenuifolia (also in the writer's garden) is common here and is completely hardy. *Hymenocallis galvestonensis* has nearly the status of a weed in this locale, growing well under conditions of poor drainage, with or without adequate rainfall. Synonyms here for this species are "swamp lily" or "snake lily". The writer dug a clump of these from the wild and replanted them in ordinary soil, and it will be of interest to see if they establish by next spring and give blooms.

In the past, the writer has read much about *Lycoris radiata* (red) in the South, and it is certainly true in this area. One sees them in almost every garden and yard, and clumps grow wild in uncultivated fields. They are especially attractive as border plants along walks and, as of this writing, their blooming period is just about finished. Both *L. radiata* (red) and *L. squamigera* were planted out by the writer after his move last year; however, neither have bloomed this year, which is not surprising, owing to the very long time required for each to establish. *Brunsvigia rosea* made excellent growth last winter, but of this writing has not bloomed, although the plants have been dormant all summer.

Crinum asiaticum, although not widely grown, is common here. The two large specimens, grown in tubs by the writer in Washington, were planted outside; each has since divided and the plants have grown magnificently this year. They are perfectly hardy and, although the foliage "kills back" in the winter, the bulbs have withstood temperatures at night as low as 25°F.

With regard to *Sprekelia formosissima*, it is a pleasure not to have to handle this species any longer as tender bulbs. These established rapidly on transplanting, and made good growth during the remainder of last summer and the fall (which reaches nearly to January). In the spring, the writer was rewarded by blooms, 4-6 at a time, lasting for about three weeks. They are, therefore, perfectly hardy, as are also *Habranthrus (robustus* and *brachyandrus)*, which did very well this year.

Perhaps the most striking difference between southern Louisiana and the Washington, D. C. area is the onset of growing weather. Because of the early advent of spring here, the crinums, in particular, *C. powelli album*, bloomed in late April and early May, as opposed to

mid June in Washington. The *Sprekelia*, planted directly in front of these, bloomed at the same time, and this proved to be an attractive combination.

In conclusion, it may be stated that there are, indeed, distinct advantages in growing amaryllids in this part of the country. Of course, it goes without saying that the sun is brighter than in northern climes, and the winters are milder, but also, sharp variations in temperature are not encountered and, in the summertime, adequate rainfall is provided, when the "monsoons" arrive. Hopefully, in the future, additional comments of more specific interest will be forthcoming.

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LYCORIS THRIVE IN WESTERN NEBRASKA

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[Editorial Note.—The following is excerpted from a letter received from Miss Vivian Grapes under date of September 30, 1968. This shows that two very beautiful Lycoris species are frost hardy in the North. Nurserymen, including Claude A. Barr, Smithwick, South Dakota 57782, are urged to propagate stock of these for general distribution in the North.—Hamilton P. Traub]

Thought you would be interested to know that the bulb of *Lycoris chinensis* you so kindly sent me in 1962 bloomed for me July 16, 1966, one scape with four flowers; and this summer, July 18, 1968, two scapes each with four flowers. I am so thrilled to have this beautiful *Lycoris* species to survive and bloom in Nebraska.

Lycoris caldwellii planted in 1958 first bloomed September 11, 1960, and produced two scapes September 9, 1967.

Both species are growing outdoors in my garden.

I would dearly love to try *Lycoris sperryi*, *L. kiushiana*, and other species making leaf growth in spring and early summer in the hope of finding others that are frost hardy in western Nebraska.

I am not having much success with *Lycoris* species that produce foliage in the autumn and winter.

[Editorial Note.—Those who have Lycoris species and hybrids which produce their foliage in spring and early summer are urged to send some surplus stock directly to Miss Grapes for use in her experiments in order to speed up this work with the objective of determining which Lycoris species are adapted to the extreme Northern climate.]

AMARYLLID EXPERIENCES IN FLORIDA, 1968

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Florida has been plagued for quite a number of years with lack of rainfall, but the season from September, 1967, to May, 1968, was

especially dry and so amaryllis bulbs suffered much. Many lost their entire root systems and even though I watered all the beds almost continually it did not seem to do much good. Bloom was scarce for February, March and April which were cold months and this together with the drought made everything late. In May, however, things changed and we received 5.4 inches of rain, and it has continued to rain in quite large amounts almost every day since.

Outdoor *Amaryllis* bloom was late, the first bud opening on March 9. Many seedlings bloomed but I could not trace the origin of these since dogs and children have done away with all my markers over the years I have lived here. Not many Dutch bulbs bloomed but those that produced flowers were excellent. A seedling Dutch cross much like 'Belinda' produced three bud scapes and only a few produced two scapes. I was most happy to have one scape appear after such a dry season for I think I had only about 20% of my many bulbs to produce buds.

In October I ordered a number of new bulbs from Mr. Goedert. Since this was late for ordering I did not receive all that I ordered but Mr. Goedert always makes this up by sending extra bulbs, all of which were lovely, and were African bulbs. The only Dutch bulb I ordered was 'Tarakan.' For many years I have searched for a lovely black-red shade among the amaryllis listed and 'Tarakan' surely answers this description. It it very fine in both color and form and I can recommend it highly for those of you who like dark red bloom. I had some bloom on old *Amaryllis striata* in the house. It is much like the amaryllis they call "the wild amaryllis" here in Florida which blooms very profusely in protected places out of doors. Several Sundays we had huge bouquets of these "wild amaryllis" in Church and they were really breathtakingly lovely. I was given a dozen bulbs and I hope I have them planted in a spot where they will receive enough winter protection so that I will get bloom in February or March. Old *A. reginae* also bloomed in the house. It has been a shy bloomer for many years but seems to like its Florida home as this is its third blooming season here. Flower is called coral in shade and has no central spot or star but is much the same shade as old "striata".

Crinums bloom after the amaryllis are done and are very attractive in large group plantings. My favorites are "Ellen Bosanquet" and "St. Christopher Lily", the name given here to a *C. giganteum* Hybrid. None bloomed as plentifully as they should have done had our season been better.

Daylilies are rapidly gaining in popularity and are most gorgeous in all the new shades hybridizers are introducing. A friend of mine spent a hundred dollars for plants and will eventually have a lovely display along her lake front when they grow into larger clumps. Mine did not do as well as they should have since I had moved and rearranged them last year but I had some very nice ones. I especially like the new pinks and reds, but for a wonderful bloomer 'Sandalwood' produces

many flowers over a long period and is very nice. I am fond of all the daylilies, the light yellows such as 'White Sails', the golden yellows, the deep orange and even some of the eyed varieties such as 'Varsity' tho these I do not care for as much as the clear colors.

Last summer (1967) I was called north in July by the death of my only sister so now I have no one here in Florida. She lived here but had gone north to spend the summer with her children up there. I I did not care to return home at once so visited a short time in Ohio. Friends at Columbus took me to Mansfield, Ohio, to visit the lovely Kingwood Gardens there. The day lilies were in bloom there and I wandered to my heart's content among them listing names of varieties I liked only to find when I looked them up that they were just too expensive for me to buy since I never know just how long I will live in this house. I kept the list and will watch for lower prices as they become more plentiful. Kingwood Center is a lovely place at any time of the year and well worth a visit if you are in that vicinity. Their many greenhouses have year round bloom and there is always something fascinating to enjoy.

Florida is so green and lovely now I wish you might all see it. Of course we have lots of electrical storms in the rainy season but our lakes are again filled with water and the lawns grow so fast it keeps everyone busy keeping them cut and trimmed. I hope all this rain will make my next amaryllis season the best ever.

FOUR COMMON "MILK & WINE" CRINUMS

L. S. Hannibal, *Fair Oaks, Calif.*

Four of our most attractive 'Milk and Wine' *Crinum* clones bear a striking similarity to each other and cause no end of confusion in identity. These are *Crinum submersum, grandiflorum, virginicum* and 'Empress of India'. All flower within a few weeks and have large, flat-face, open blossoms which bear typical *scabrum* markings of waxy white petalegs striped by a pink or red keel. In foliage and bulb there is a general similarity, and though the true *C. scabrum* does not have the slender foliage or elongated neck found in this group the bulbs inevitably are classed as variants or hybrids of *C. scabrum.* Actually only one contains *C. scabrum* blood and all are appreciably hardier. If it were not for some senior members amongst the bulb collectors we would be in a bad way attempting identities because these plants date back to the gay nineties and any written descriptions are as brief as the old catalogues.

The first bulb, *Crinum* x *herbertii virginicum*, was introduced by van Tubergen about 1885. We have no way of telling now if it was one of Herbert's original *C. bulbispermum* x *scabrum crosses.* It could be since he distributed samples to Dr. Carey in Calcutta as well as to other friends in tropical areas. If not, then it is a repeat of this cross. It has the foliage stature of a *C. x powelli*, but cleaner, more erect and slightly

more succulent. The 24-inch scape carries an umbel of 8-10 open star-shaped blossoms which resemble an open flowered hybrid *Amaryllis* with pointed tepalsegs. These have pink keels against a white background; the margins are often ruffled. The tepalseg width at the heel of the limb is 1¼ to 1½ inches and the span of the blossoms are 7 inches or more. Usually 4 or 5 buds open each evening.

The second bulb is the old French hybrid *C. grandiflorum* from Marseilles which van Tubergen listed from 1896 to 1910. It is a cross of *C. bulbispermum* with *C. careyanum*. The foliage is noticeably less acutely tipped than *virginicum* and the tepalsegs are nearly linear having an approximate width of one inch; the tips are blunt. The flat faced blossoms have a span of 7 inches and typical pink keels. The blossoms tend to collapse to a trumpet shape and become campanulate on the second day. Some people call the plant *grandum* as Henry Nehrling used this name. Excepting for the slight differences noted in the tepalsegs and foliage shapes, *virginicum* and *grandiflorum* can be readily confused.

'Empress of India' has open star shaped blossoms like *virginicum* but the foliage spreads in a low rosette with the tips arching over to the ground. It may be a *Kirkii* hybrid as there is great similarity in the blossoms and foliage, however, the tepal tubes are quite slender. The breeder is unknown; both Reasoner Brothers at the Royal Palms Nursery and van Tubergen listed the bulb about 1905. It is not as hardy to winter cold as *virginicum*, but grows well in an 8 or 10 inch pot.

The last plant, *C. submersum* Herbert appears to have been introduced by Reasoner Brothers as *C. kunthianum* from Nova Granada on the western slopes of the Mantiqueira Mountains which lie back of Rio de Janeiro, Brazil. It resembles *C. scabrum* or *grandiflorum* with its broad glistening white petalsegs which are striped with deep pink or vivid red keels. The plant has been commonly confused with *C. fimbriatulum* or *C. zeylanicum* due to these floral markings, the acutely curved tepaltubes and declinate filaments—Features which are typical of the *Codonocrinum* subgenus. But the plant also has bright yellow pollen, and the blossoms are patent and have a strong vanilla fragrance. Moreover the foliage is bluntly tipped and closely resembles a broad leafed *C. erubescens* or *C. kunthianum*. All such latter features are common to the American *Platyaster subgenus*. Despite these widely conflicting features which caused Dean Herbert to wonder if he had encountered a transitional species, *C. submersum* is allied to *kunthianum*. The tepals are a good inch wide, linear-oblong in shape and completely patent giving flat faced blossoms of 7 inches span (See American Horticultural Magazine Oct. 1968) not unlike the other three 'Milk and Wine' garden *Crinum* already described. The plant differs from *C. kunthianum* by the larger size of the blossoms, their vivid coloring and the unusual *Codonocrinum* features including the sharply bent tepaltube. The foliage is broader at the base. We can attribute these unusual features, which are indeed transitional, to the misty year-around rains so necessary to the Coffee plantations about Rio. Similar

transitional features are found in some forms of *C. crubescens*, likewise with some *C. flaccidum* growing along the Great Barrier Range in Australia. Evolution was not understood in Herbert's day but his writings indicate that he considered the *Crinum* forms with straight tepaltubes to be more closely allied to *Ammocharis* and *Brunsvigia*, thus he concluded that the *Crinum* with the curved tubes were an offshoot of the straight. This is in agreement with current views.

Apparently *C. submersum* is quite common in Florida. It throws numerous offsets and soon forms compact clumps. It does not need the aquatic conditions as Herbert assumed and is hardier than *C. scabrum* since the writer has grown bulbs out of doors through wet Sacramento winters for several years. We are inclined to believe that this is the plant Henry Nehrling refers to as *C. amabile* in his section in Bailey's Cyclopedia of Horticulture. (The true *C. amabile* resembles *C. asiaticum* and is four feet tall. It is surface growing and would freeze out in Florida.)

The writer has never heard of 'Empress of India' being fertile. The same applies to *virginicum* but other forms of *C.* x *herberti* have been reported as pollen viable on *C. bulbispermum* so it may have possibilities. We have ample proof that *C.* x *grandiflorum* is fertile as it has been crossed both ways with *C.* 'Cecil Houdyshel'. This suggests that *grandiflorum* may be a polyploid. There may be seedlings scattered about Florida. Unconfirmed reports exist that *C. submersum* has very viable pollen. We will try it for seed in Hawaii. The Kona climate would be perfect.

DAFFODILS—AUTUMN, WINTER AND SPRING JEWELS

Miss Helen A. Grier, *4671 Palm Avenue, Yorba Linda, Calif. 92686*

How many readers of bulb catalogs are aware of the introduction date of 'King Alfred'? In this jet-age it is surprising that a daffodil introduced in 1899 is still popular. That this is so is due to the lack of knowledge of what has been taking place in the daffodil world. True, careful selections made by reputable dealers over the years has improved the strain since it was introduced; however, it is away below the quality of the many new cultivars (varieties) on the market today. Breeders in Ireland, England, the Netherlands, Australia (including Tasmania), New Zealand, and the United States are responsible for the many fine things available today.

It is recommended that one begin a journey of discovery among the newer daffodils with the catalogs and pricelists as guidebooks. There are forms, colors, types and sizes now, that were not dreamed of in that gas-light era. One of these new developments are the reversed bicolors. These flowers have their tepalsegs darker than the trumpet, corona, or cup, and are enchanting things such as 'Honeybird', 'Entrancement', 'Spellbinder', 'Bethany', 'Daydream', 'Limeade', and 'Binkie'. These clones represent years of selective breeding by growers

in Ireland and Oregon. Mr. Grant E. Mitsch of Canby, Oregon, has done more with this class than has any other breeder; not limiting his efforts to one or two divisions, but continuing this tremendous advancement of color into the smaller divisions, such as Division VII—Jonquil, with 'Pipit' and 'Verdin' available at present with the promise of more to follow. These are exquisite and very fine novelties.

If the thought of the yellow tepalsegs and white cups does not attract you, perhaps the pink cupped forms would, or the clear whites, or maybe the red cupped yellows. All are lovely and each garden should have a smattering of them to give it depth, and to provide a longer and greater enjoyment to all who are privileged to view it. Present day daffodils can be had in a wide range of blooming periods far greater than the two week span of the venerable 'King Alfred'. With a careful study of the catalogs, blooms may be had from late winter until late spring as not all flower at the same time.

Here, in southern California the season starts with that odd little species *Narcissus viridiflorus*, a green flowered jonquil with a heavenly fragrance, which is a fall bloomer opening well before Thanksgiving. The 'Paper-White' and 'Soleil D'Or', members of Division VIII—Tazettas, are in bloom from November through January. Other early blooming cultivars are the Cyclamineus hybrids of Division VI, 'February Gold' and 'Peeping Tom'; the red cupped member of Division II, Rouge; Mr. Mitsch's lovely pale trumpet 'Moonmist' is one of the earliest. These will be in bloom before February; from then on, until the poets close the season in late April or early May, daffodils can grace your garden.

A wind protected location which receives filtered sunlight through a spring flowering tree can be an ideal situation for raising daffodils. If one keeps in mind the scale of the site selected and is governed thereby in the choice of clones, the whole can become a jewel of garden planning, and the memory of which can sustain one through many a hot and trying day.

The requirements for culture are simple. A well and deeply dug soil, enriched at the lower level with humus and bulb food, low in nitrogen and non-burning such as the sludge derivatives. The bed should be prepared in late summer so that it will be settled and ready to receive the bulbs at proper planting time. Here, in southern California, that is in the later part of October and the first of November, or whenever the heat of summer has past and the ground remains cool to the touch, even at mid-day. The bulbs are planted at a depth two to three times their diameter, and are watered well after planting to firm the soil around them and to start an early root action. From then on, the beds are always kept damp. When the tips start showing through the ground, a side dressing of a liquid fertilizer of low nitrogen content is given; when the tips of the buds appear, a similar feeding is given.

If the fertilizer is acid in reaction, such as the 4-10-10 type used for acid loving plants, the color of the blooms will be improved.

Following the blooming period another feeding should be given, this one of a 2-10-10 or 0-10-10 formula to assist in the formation of hard sound bulbs for the coming season. A fertilizer high in nitrogen will produce more succulent bulbs, but in a hot climate this can be detrimental, as such bulbs are more prone to rot when left down during the hot summer months.

Should the drying foliage offend ones aesthetic sense, the planting of screening annuals may be practiced without detriment to the bulbs, provided one doesn't spear them with a planting trowel. Petunias and alyssum are excellent; they require little water during the summer and what is given is absorbed immediately, and they form a nice mat to keep the soil cool during the hot weather. As the foliage dies back, do not break, braid or twist it off, but let it age normally, for in doing so it is storing food and forming buds for the following season. To damage the foliage at this time is to destroy the blooms for the next year and to endanger the life of your bulbs. When the foliage is brown and prostrate, remove it with a slight tug if necessary to free it from the bulb. Where the leaves come through the soil round holes remain. Drop a few granules of insecticide down the holes and fill in with soil. This will discourage sowbugs, earwigs and the like from feeding on the dormant bulbs. When it is again cool in the fall begin watering the bulb beds and give them a good side dressing of bulb food as when planting. Tuck in a few blue violas or white primroses to add another facet to the daffodil setting, and soon another season will begin.

If a word about clones (often incorrectly called varieties) is needed, let it be said that the best is not always the most expensive. It is the newness and the scarcity coupled with the demand that governs the price.

Excellent examples in the Trumpet Division (I) are, in the order of their appearance, 'Artic Gold', 'Kingscourt', 'Gold Court', and 'Ulster Prince', all of which are yellow to golden yellow; of the pale yellows the first is 'Moonmist', with 'Inver' blooming a bit later, both are cool, clean and lovely. Bicolor trumpets are among the first of all to bloom and the clones 'Foresight', 'Lapford', 'Trousseau' and 'Prologue' are recommended. Perhaps, the finest bicolor to date is the elegant 'Descanso', but it is new and a bit high in cost. Pink trumpets are rare, but the bewitching 'Rima' is a "Must have" on anyone's list.

Division II—Large cupped daffodils—is the largest of all the divisions with the greatest number of types to choose from; from the deep gold of 'Ormeau' through to the pale tints of 'Lemnos' to the bicolors 'Polindra', 'Festivity', 'Green Island', 'Statue', and 'Irish Charm'. The gold and red cupped cultivars are 'Revelry', 'Red Goblet', 'Fire Proof', 'Ceylon', 'Border Chief' and 'Ballymarlow' to name but a few to whet the interest in these fiery numbers. This group and their companions, the red-orange cupped whites have the greatest carrying power in the garden. They shine like beacons and a wide selection is available

including 'Arbar', 'Red April' and 'Kilworth'. The all whites inclu 'Ludlow', 'Purity', 'Arctic Doric', and 'Easter Moon', these are a costly due to demand but are most lovely. A characteristic of the whi seems to be the requirement of sharp drainage. If one wishes to ha white daffodils without the expense of the higher priced sorts, it advised that one plant the lovely and quite hardy triandrus hybri 'Tresamble'. Some of the most enchanting of daffodils are to be fou in this, the Division V—Triandrus. Even their names are poetr 'Rippling Waters', 'Honey Bells', 'Ivory Gate', 'Dawn', 'April Tear and 'Rosedown', the latter being yellow as are 'Kings Sutton' an 'Honey Bells'.

The Cyclamineus, Division VI, include among the earliest an most distinctive of daffodils, with their wind-swept tepalsegs resemblin the true cyclamen, but coming in yellows which the cyclamen do not Valuable additions to the garden are 'Jenny', 'Dove Wings', 'Charity May', 'Bushtit', 'Wood Cock', 'Spring Peeper', 'March Sunshine', and the tiny and enchanting 'Mite'.

The jonquil derivitives of Division VII are among the most fragrant and bloom from February with 'Hesla' and 'Sweetness' through until the last of April with the smaller 'Baby Moon' and 'Baby Star'. Pink tinted jonquil forms are scarce, but 'Cherie' is available to all and an excellent one.

Specimens from Division III—small cupped daffodils and Division IV—doubles should be placed in a cool shaded spot with plenty of moisture as they are among the last to flower due to their close relationship to the poets of Division IX. The all white forms from Division III, 'Chinese White', 'Bryer', 'Silver Mine', 'Silver Princes', and reprieve are listed in many growers' catalogs and a few should be included in any collection. A pine tree makes an excellent foil for such as these and for the poets 'Actaea', 'Milan', 'Dactyl', and the late, late 'Sea Green', which is sometimes in flower as late as May. Yes, even here in southern California. The pine tree needles make an excellent summer mulch for the bed to keep the soil cool and provide additional acidity.

Not every one enjoys the large puff-ball doubles of 'Windblown', 'White Lion' or 'Sunburst', but few can resist the precise elegance of 'Aeropolis'. While this clone is still in the novelty category, even new and finer forms are being bred in Ireland and Oregon. Mr. Murray W. Evans of Corbett, Oregon has been active in the development of hardier doubles more suited to the various climates of the United States than are the previous introductions from Ireland.

There are many more than can be listed here, some of which are as easy to grow as weeds, others are most difficult. But, which ever you prefer take the time to come to know them well and you will be rewarded.

THE 1968 AMARYLLIS SEASON

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Many seasons have passed since as many fine blooms were seen as during this past season. Especially fine reports were received regarding seedlings that flowered for the first time. Many are enjoying raising seedlings. Seedlings are interesting particularly as one can add many colors to his collection not available in named clones. The lighter colors, blends and bi-colors are very popular. Each seedling is an interesting individual and much satisfaction can be obtained in having a few to flower each year.

Some fans make their own crosses. This is interesting; however, if one does not choose the seed parents wisely the results will be inferior. It is wise to obtain the best seed possible because you are going to pet these seedlings along for 3 to 4 years and you surely do not want to be disappointed after spending many hours of watering and caring for them. While raising a few seedlings from your own crosses is interesting unless you have a large collection it is very hard to time the flowering period to have the exact two plants in flower at the same time (unless one cold-stores pollen). One should not waste his time on chance crosses when good seed can be obtained from a reliable hybridizer.

Whether you live in the north and grow your amaryllis in pots or in the south where they grow in the border I recommend trying a few seed each year. In three or four years you can have several new ones blossom each season. It will give you a lot of satisfaction and pride in its accomplishment.

CULTURAL RECOMMENDATIONS

Again this past season, as in most seasons, I received letters from those who dearly love *Amaryllis* but just fail in keeping them growing from year to year. Part of this failure, I am sure, is due to the lack of understanding of this plant. One must first understand that the commercial clones of amaryllis are hybrids. The exact requirement for each variety is a little different. In addition one must understand that most clones come from but a relatively few growers in Holland. The bulbs are raised in greenhouses under ideal conditions and since Holland is on a latitude with Canada, they have to provide heat even in the summertime to maintain a temperature of 68°F. This is the optimum growing temperature for some Dutch amaryllis. Few of us in the United States can duplicate this condition especially in the South unless we have an air conditioned greenhouse.

There is another factor we should recognize when we grow the Dutch clones. The Dutch hybridize to produce prime bulbs in as short a period as possible that will produce a fine flower when potted up. They do not breed for garden type plants, neither do they breed for pot plants that will flower year after year for you. We owe a great deal to the Dutch growers for their work on amaryllis for today I seriously

doubt we would have the beautiful hybrids we have if it were not for them. They stubbornly and constantly worked with this plant when its commercial value was questionable. The Dutch are due a great deal of credit for their work with amaryllis; however many of the faults we find with todays clones, especially in the south, is our dependency on the Dutch growers for our bulbs. They are not as adaptable to our climate as they would be if we had local hybridizers and growers. This is a weakness that few fans understand or show much interest in changing. They just have not supported the American grower in the past.

In what I have said I do not mean to infer any discredit on the Dutch grower. The point I am making is that the faults we find with our amaryllis clones should be expected. We will never find a fully acceptable amaryllis strain to grow in Florida by depending on the growers in Holland. Neither could the Dutch depend on us to develop a strain commercially satisfactory for them. It just does not work this way.

We do need to develop improved hybrids for pot culture and for the border in our country. What will grow in the cooler dry, higher areas of California are not going to do as well in our warm wet coastal areas. Each area needs to develop its own strain. This is why I encourage all fanciers to grow a few seedlings each year.

I do not wish to encourage you to give up growing the fine Dutch clones for I never would do this and they surely are especially needed in hybridizing. The point I am trying to make is you can be more successful with them if you try to understand their requirements and not be one of those 'know it alls' who believe amaryllis are tropical plants and the hotter it is the better they like it. Try to understand how they are raised in Holland and try to duplicate these conditions as far as possible. One can improvise and I will try to give you a few hints I have found helpful myself.

I have grown many of the Dutch clones in the past 10 to 15 years. I have had many failures. I have had success with some clones the Dutch introduced and found they failed for them in a few years but here they thrived. You will find some Dutch clones will adapt themselves to your conditions much easier than others and some are going to fail. Of course I feel all the Dutch clones are worth the money even if we only get one flowering season from some. *You surely could not get anything nearly as beautiful in cut flowers from the florist for a comparable price.*

Here are a few points one should keep in mind when growing the Dutch clones although generally this is good for all others.

1. Most amaryllis hybrids do not like it too warm. 68° to 80° F. is best and I am told 70°F. is near the temperature the Dutch use.
2. Do not over water. The Dutch grow their amaryllis in beds or vats in the greenhouses where watering can be controlled.
3. Start with clean soil. Clean cultivation is essential.
4. Soil used should be slightly alkaline, open texture and rotted for two years if it contains much organic material.

5. Do not put large amounts of manure with your mixture. If you do you will have root trouble. Top dressing lightly with manure is better.

6. Avoid sudden changes in temperature of the bulb during the flowering season and during the growing season.

7. Try to keep your amaryllis growing through July and August for if you can they will make their best growth as the weather cools.

The trick is to find out how one accomplishes this in his own area. I will particularly comment on what I have found best in my area. First, I grow my amaryllis in pots. A porous pot will help cool itself from evaporation, especially if set up off the ground. I use tables with air spaces between each board. If the amaryllis bulb is planted well down in the pot and covered with a good insulating soil it will help. Lightly watering in the heat of the day will cool the plant. One should also give some shade but not too much. In a west exposure the ground apparently does not heat up quite as much. You may have other ideas.

Second, if you have amaryllis in a greenhouse or under cover do not over water. They will stand more dryness than wetness for if the soil gets soggy you will surely lose the roots and your bulb crop. If you have your amaryllis protected from the rain it is a matter of not over watering, but if yours are outside like mine and many others, I am sure, then you must guard against a steady rain which will flood the pot and may cause water logging unless you have excellent drainage. Drainage is getting rid of the excess water in the soil. Many factors are to be considered in this. Normally the larger the pot the better drainage you will need. You will need better drainage in a plastic non-porous pot than in a clay or porous pot. How do you get drainage? First you should provide an open textured soil that will hold some water and still drain sufficiently. You can have a soil too open textured which will retain too little water. However, normally the reverse is the case and you will have to take other precautions to eliminate excess water. One way is to use a clay or porous pot. A second is to reduce the size of the pot. This will foster drainage, particularly in a clay or porous pot but even in a plastic pot it will lessen the ratio of the volume of the soil and water to the bulb's ability to take up water. Planting more than one bulb to a pot will also help reduce excess water in the soil as two or more bulbs will take up water two to three times as fast as one. I recommend very strongly planting several bulbs in one pot. *Amaryllis* seem to naturalize in clumps and often a clump can cope with a prolonged rainy spell where a single bulb will lose its roots. I have found particularly with the species *A. belladonna* that once a clump has established itself it can cope with growing in damper areas where it ordinarily would not thrive. Once your bulbs have established a good root system they can stand a lot more water.

There are some advantages in a large pot. *Amaryllis* bulbs do not like sudden changes in temperature. The larger the pot the greater the mass and the longer the pot has to be exposed to a change in temperature before the temperature of the pot will change. Of course if you

have controlled conditions this will not be a factor but in the ope
definitely is. Planting several bulbs in a larger pot will insure be
drainage and prevent the bulbs from being subjected to as much cha
in temperature. If you raise your amaryllis in pots in the open
must remember a hard rain will often wash away much of the food
the soil and you will have to fertilize them more often particula
after prolonged rains.

One should maintain clean culture. Start with clean soil. It p
to soak your bulbs in a good insecticide before planting. I also f
drenching the soil of my potted amaryllis, about every 8 weeks, with
solution of Cygon and water very helpful. This is especially true
you have a plant that is not doing well and you do not have time
repot it. A drenching of Cygon and water will often start it back
recovery. Clean soil can not be over emphasized as it is where most
your trouble lies. In making up your soil if it has much organic mat
rial in it be sure it is well rotted. Green organic material especially
the soil is not well drained will rot your roots. If you can not contr
your water do not put much organic material in your potting soil.
is much better to add it later as a top dressing. Large amounts o
manure in your potting soil should be avoided.

In planting amaryllis if they do not have live roots or have done
poorly somewhere and you have dug them, washed them and are re
planting them, if there is any doubt as to their being free of disease
or insects, it will often be wise to cut the basal plate off even with the
bottom of the bulb. This will cut away infection both from insect and
fungus that often goes up into the bulb when the roots die away.

If your bulbs have good roots they probably are fairly free of
insects and disease. When planting in this case pull off all damaged
or dried roots. Fill your pot about half full of soil. Turn the bulb
upside down and let the roots fan out. Then insert the bulb into the
pot holding the roots in place letting them spread out up the sides of
the pot and over the edge. Fill the pot and if you have the time tuck
the roots hanging over the sides back into the surface of the soil. In
forcing new bulbs I find using pure sphagnum moss in a Tuffy pot
excellent. No fertilizer is needed until the bulb has flowered. I do add
at times a little fertilizer to my watering when the scape is about finished
developing and the flower bud begins to elongate. This gives the bud
the extra boost to win the tri-color. Fertilizing before the bulb flowers
will often bring leaves to the detriment of the flower. During the
growing season your amaryllis need a steady supply of fertilizer. Liquid
fertilizer is good but do not make the solution too strong. I do hope
some of the things I have found helpful to me may prove helpful to
you. One has to perfect his own method, however, as it is difficult to
explain just what one does in raising his plants. Often one does not
give all the little details that are important and again the one receiving
the instructions often discounts the small details that are important.
Well, anyway better luck next season.

I think we probably all get too excited over the new clones each
season. But then again I guess we all need a little excitement in our

lives and new amaryllis clones may be a harmless type of excitement although it may prove costly. I sometimes think we neglect to raise as many of the older clones as we should and spend too much time and money on the new ones. However again the new ones are the ones in which we look for improvement in color, etc. It is a great temptation.

AMARYLLIS CLONES

In reading over some of my comments on clones during the past several years it sounds like a record on the stereo that just keeps playing over and over. So this year I would like to give you a 'Quicky' list on some of the older clones and a few new ones that have done particularly well for me. Here they are!

WHITE: 'Marie Goretti', 'White Christmas', 'White Giant', 'Flying Cloud', 'Queen of the Whites' and 'Oasis'. PINK AND WHITE: 'Apple Blossom', 'Love's Desire', 'Pygmalion', 'Rose Elegance', 'Rose Marie', 'Little Diamond', 'Floriade'. SALMON & WHITE: 'Maragret Rose', 'Sweet Seventeen', 'Day Dream', 'Loveliness', and 'Mozart'. ORANGE & WHITE: 'Pinksterflower', 'Golden Triumphator' and 'Glorious Victory'. LIGHT PINK: 'Flora Queen', 'Eastern Dream', 'Dawning' and 'Dutch Belle'. MEDIUM ROSE PINK: 'Pink Favorite', 'Fritz Kreisler' and 'Daintiness'. PICOTEE: I like them all, some difficulty with some but new clones are improving. WHITE STRIPED RED: 'Peppermint', 'Orion' and 'Schubert'. RED & WHITE HEART: 'Hellas' and 'United Nations'. BRIGHT RED: 'Loberia'. MEDIUM RED: 'Ludwig's Scarlet', 'Scarlet Leader' and 'President Kennedy'. DARK RED: 'Vintage', 'Purple Queen', 'Ludwig's It', 'Belinda', 'Bernice' and 'Tarakan'. ROSE: 'Rubra', 'Rosedale', and other African varieties. DARK ROSE: 'Violetta', 'Morena' and 'Bordeau'. ORANGE: 'Orange Wonder' and 'Tangerine'. SALMON: 'Beautiful Lady' and 'Salmon Giant'.

You can compare this list with your list and I am sure it will be very interesting to see how they compare. Of course I did not name all the good ones but these happened to stand out in my memory at this time. I am sure I could add others as well as I know you have your favorites. I am sure many of us have our own favorite seedlings also. I know many of you have unnamed clones you would not part with and I also have many. Once in a while I like to talk about these as I feel sure you do about yours.

MY UNNAMED SEEDLINGS

First I would like to comment on the parents of the hybrid I call "Leopardina". This is a coined name for some hybrids I have that, in my opinion, are closely related to *A. leopoldii* and *A. pardina*. The parent stock of most of the "Leopardina" hybrids are three clones. One I call "Bloody Mary", another "American Beauty" and a third "clone No. 700". I do use the seedlings of these clones for breeding but mostly the "Leopardina" hybrids are from these three clones. You might be interested to know where these clones came from. "Bloody Mary" was found in some India hybrids. The clone, "American

Beauty'', originally came from Guatemala many years ago. The Lady who gave it to me, that is the original clone, obtained it in Guatemala. However she says Mr. Cammack had it or one very similar to it which he called ''American Beauty'' and that is why she called it by that name. She feels it is the same clone Mr. Cammack had. The third clone is an odd clone I received from Warmenhoven in a shipment of pink and white clones.

All three clones grow vigorously. ''Bloody Mary'' is very white with blood red flushing. It actually looks as if it is bleeding, the red is so brilliant. The tepalsegs are extra wide, often 5 inches across, very round and the flower is a good 8 to 9 inches across. ''American Beauty'' is white and rose, about 7 to 8 inches in diameter and of good form. Both of these are very beautiful flowers. ''Clone 700'' is a well formed flower 7 to 8 inches in diameter but is somewhat of an ugly duckling. It is whitish green spotted and picoteed red to violet red, very dark, not much of a looker but has color pigment, is vigorous and makes nice seedlings. I cross these on self seedlings of these three parents generally and get whites, red and white, rose and white, some with purple tones and picotee types. Most people who have flowered these seedlings marvel at their coloring and beauty.

Another interesting hybrid I have developed is what I call ''Sunsets''. These are crosses of the Dutch Ludwig's Pink clones on seedlings of a cross between an Indian hybrid and 'Daintiness', I believe. These hybrids have many fine pinks, rose pinks, brick rose, orange and salmon colors among them. The original Indian clone was a large rose with white throat that appears to have quite a bit of *A.* x *johnsonii* in it. I feel if one would cross Ludwig's Dutch clones on *A.* x *johnsonii* he would get interesting large flowering hybrids good for cultivation in the south.

Over the years I have saved the best seedlings of ''Gracilis'' that I have flowered. At first I had trouble with this strain growing here but I have about ten clones now that grow very easily. Most have 6 flowers per scape and are orange. Possibly by selecting these still further I can obtain a strain that can easily be raised in a pot. I feel we give too little attention to these fine small amaryllis. They are wonderful pot plants when established. I had some pots last spring with as many as 20 flowers open at a time. They were really beautiful.

I have another cross from Mr. Cooper of Hawaii. It is *A. aulica platypetala* x 'Floriade'. I can not make this cross myself but it is a fine one that produces large late flowers, mostly pen stripes; a very fine hybrid. I feel it should be called ''Cooper's Hybrid''.

THE HARRISON HYBRIDS

Before I quit rambling I would like to say a little something about the ''Harrison hybrids'' which will be available to the public this season. I know many will be asking questions about them. This is an interesting group of hybrids developed by the late Mr. Harrison in his mountain garden in Mexico. They are interesting for a number of reasons and since Mr. Harrison was murdered this adds a strange and interesting

side line to this strain. As I said they were developed and raised in the mountains of Mexico where I am sure the temperature is cooler and much more even than here in the south. These bulbs should be best suited to the cooler areas of California and the west where the nights have been too cool for other amaryllis hybrids. Try a few of these if you are in one of these areas. The bulbs of the "Harrison hybrids" vary a lot in size. I am sure Mr. Harrison was growing these for his own pleasure and was not interested in commercial production as I do not feel he let size of bulb influence him in his selection. I feel with the many medium size flowers in this strain he saw beauty where it was and size did not influence him greatly. Most men like large flowers and this is somewhat strange as many Men's idea of beauty in women is not bigness. But then I am talking about amaryllis and this is quite a different thing. The size of the Harrison bulbs vary a lot; so do the size of the flowers. Some are very large; others are what I call medium size. None are as small as the "Gracilis".

I do not think Mr. Harrison had anything particularly in mind but beauty. The color range is quite extensive. If there are any dominating colors it is possibly pink and white and striped varieties. However, there are solid colored ones from lightest pink to dark rose, from light red to near black, some exceptionally beautiful large salmon and orange ones that are very scarce among the Dutch clones. If there was one color he preferred, I would say it was the 'Apple Blossom' types. These show the influence of 'Apple Blossom', I am sure. There are some beautiful pink and whites that vary in color to lavender pink. These in my opinion are very beautiful. There are some huge white penciled red. There are picotee types, some have six or more flowers per scape. They open up quite a possibility for new types and colors in hybridizing; something we need.

As I write this to make the last minute dash before publication I look back to the same situation each year and if I might take the privilege to make a little personal observation, now that I am retired from my regular work, I do hope in the future I will find time to be more timely. I am sure your editor will agree that this is desirable and I would like to thank him for his patience. I feel we all should appreciate the great effort he puts into editing the Amaryllis Year Book.

AMARYLLID CULTURE IN VIRGINIA

Mrs. Mary J. Forberg, *21 Albermarle Av., Richmond, Virginia 23226*

In the State of Virginia we find four general divisions for growing plants, according to the topography. They are namely, Tidewater, where the soils are nearly sea level, Piedmont plain, where the salt water comes up as far as Richmond in the James River and stops at the locks, the mountainous Shenandoah section, and the Southwest, where the land is very productive.

Richmond offers a pleasant climate and is a mecca for plant lovers. Chesterfield county adjoins on one side and here the growing is affected by a variety of soils and weather as it is influenced by the Appomattox and the James rivers. A County Agricultural Agent in extension work showed slides at my garden club. Among them was *Crinum americanum* grown in a large clump in his yard. This was in full bloom with many umbels fully headed out at once. This clump has been there for six years; having been transferred from a bog in Alabama.

On the opposite side of Richmond is Hanover and Henrico County. This section produces lush bulb growth and good farm products for the table. According to the County Agent, there is a favorable current of air over this section which persists. The vegetables, fruits and flowers from this section have great vigor, substance and color and are ready for the early market.

As the hardy amaryllids resent being moved and cultivated, it is necessary to start by planting in good friable soil, using a quantity of old well rotted manure and leaf mold, at planting time. A goodly amount of this placed under the bulbs when planted pays off in later years. A while back we had a long rainy spell when moisture fell each day for six weeks. This resulted in die-back of some bulbs. When lifted the entire clumps had turned black as coal. We were informed by the State Dept. of Agriculture that this was the result of salt being picked up into the air and deposited later through the rains.

Plantings of *Sternbergia* and *Zephyranthes* have been successful only when in a sheltered position. *Zephyranthes atamasco* and *candida* flourish well and are the most rugged. The evergreen foliage is always pretty; these generally decorate our table for Thanksgiving.

Lycoris radiata is perfectly adjusted to this section. They multiply and thrive no matter where they are placed as long as they receive water during the flowering period. They seed easily too. *Lycoris squamageria* also grows well. *Lycoris* seeds should be thick, glossy and black and should go into the ground when in this condition. *Lycoris* should be planted a little further apart than other bulbs to keep the blooms from tangling in the wind. These bulbs should be planted up to their neck in the earth. Do not plant too deep as they will grow upwards, somewhat like a tulip droplet. This causes them to skip a blooming season or two while they rebuild the plant structure. All amaryllids resent winds which mar the large strap-like leaves and cause the flowers to fade. Many enjoy partial shade, especially Crinums. It keeps their color clear and the blooms crisper.

Many uses of mulching with leaf mold have been found. It keeps the tips of the leaves from browning, the bloom shaft is protected and soil moisture is conserved. If some of your plantings do not multiply and bloom properly, try placing some large stones or bricks about the plants. Stones are best. This helps the plant to keep the heat near the bulb longer; thus these semi-tropical bulbs feel at home again and divide normally.

During World War II, a naval officer was given his orders to return

to the States. It was necessary for him to walk several miles and carry his gear on his back in order to make his check-out station. This was Leyte, hot and humid. The officer was nearly exhausted when all at once he spotted a large group of *Lycoris squamageria,* waving in the wind in full bloom. It seemed to him to be a signal to push on as he had seen them in my yard here at home for he was my son. These are more temperamental and bloom less often than *L. radiata,* which always bloom. *Lycoris aurea,* the Golden Lycoris only responds to container-culture here. It is well worth the extra attention for it has such exquisite detail of form. *L. sprengeri* or Blue-tipped Lycoris has blunt, green foliage. It does bloom freely but appears to do best when grown in a container.

Powell's white and pink Crinums (*Crinum* x *powellii album* and *roseum*) bloom every year and are disease free it seems. They are grown in full sun, and only need extra moisture during the blooming period. The Milk-and-Wine clone I have is rather fluted and needs some protection from full sun or it does not last. These are larger flowers, more showy, but rather delicate. These bulbs multiply fast and do not mind being separated or moved. The foliage is rather a grayish green; broad and strap-like. I shall try some other species this season and let you know how they do here.

I grew one of the Chalice Lilies, *Hymenocallis narcissiflora* which is native to Peru. These bear large white, fragrant blossoms. They freeze easily and must be dug one week after the first frost. Allow the full seven days for the foods in the stalk and leaves to move back into the bulb. The roots are never removed. If you plant before June 1st., in Virginia, the plant will go to stalk and leaves, feed and multiply but will not bloom. By waiting for the ground to warm up you gain, as it will often grow very rapidly and bloom in fourteen days. Thus you can plan for a show or display and be assured of blooms. If you wish a longer blooming period, stagger the plantings two weeks apart.

I will try to grow some of the beautiful native American Chalice Lilies. These are found from North Carolina to Florida, and on to Texas. *Hymenocallis palusvirens* is found in North Carolina, and many others are found further south. *Hymenocallis caroliniana* ranges from the Carolinas and Georgia to Missouri, Oklahoma and east Texas; it is one the finest.

PLANT LIFE LIBRARY—continued from page 96.

WEATHERED WOOD WITH FLOWERS, by Mary G. Knight. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 127. Illus. Mrs. Knight has found inspiration in designing floral arrangements featuring wood as she has found it in nature. She points out that all materials suited to various flower designs are appropriate with weathered wood. Highly recommended to all who are interested in flower arranging.

TRIPLE RIDGE FARM, by Ruth Fauts Pochmann. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 233. Illus. $5.95. This is a "glowing account of a family's devotion to their Wisconsin farm and how they restored its natural wonders and beauty." This is a worth while inspirational book and is highly recommended to all who are interested in the restoration of the American heritage, and conservation.

FLOWERS AND FURNITURE IN AMERICAS HISTORIC H annotated by Elfreda Finch. Hearthside Press, 381 Park Ave. So. York, N. Y. 10016. 1967. Pp. 120. Illus. $10.00. This beautiful b concerned with the **historic houses all over the United States, an** flowers which complement the furnishings within. Each of the 45 illustrated is accompanied by a few succinct paragraphs giving its hi This utterly delightful and profusely illustrated book is indispensib all interested in home furnishing and flower arrangements.

FLOWERS AND SYMBOLS FOR THE CHRISTIAN YEAR, by Ru Mullins. Hearthside Press, 381 Park Ave. So., New York, N. Y. 10016. Pp. 160. Illus. $6.95. This is the outstanding book on flower arrangen for the Christian Year. The topics discussed include new trends, new ne Christian symbolism; flower arrangements for major events, and sp Christian occasions; secular days observed in Church and home; and Church, the club and you. Highly recommended to all flower arrangers.

ROSE CALENDAR 1969, by Hearthside Press, 381 Park Ave., So., York, N. Y. 10016. 1968. Illus. $1.75. This Rose Calendar for 1969, sp sored by Helen Page, of Hearthside Press, is suitable for use in a popu fund raising project for club groups. For the twelve months appropri illustrations, mostly formal flower arrangements featuring roses are includ Clubs interested should write directly to Helen Page, c/o Hearthside Pre

INDOOR GARDENS, by Ware Budlong. Hathorn Books, 70 5th Av New York, N. Y. 10011. 1968. Pp. 175. Illus. $6.95. Subtitled "A Coll tion of Novel Ideas for House Plant Grouping" serves as an inspiration the gardener as well as a practical guide about the details of indoor garde ing. The topics discussed include starting the indoor garden; garden deco waterfall, larger, nostalgia, movable, herb, rock, gesneriad, and children gardens; terrariums; no-sun gardens; personalized gardens; garden project and doors to more gardens. Highly recommended to all gardeners.

FRUITS FOR THE HOME GARDEN, by Ken & Pat Kraft. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 287 Illus. $6.95. The first part of this book introduces the subject of dwarf fruit trees, including culture, pest control, pruning and espaliers. The second part presents a treasury of fruits, including tree fruits, berry fruits and grapes. The third part is concerned with the experimenters garden, the suburban fruit garden, sharing fruits, fruits and health, and the future of fruits. Recommended to all home gardeners.

HOW TO PRUNE ALMOST EVERYTHING, by J. P. Baumgardt. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 192. Illus. $5.95. This is a guide to pruning practices, including specific directions for more than 300 different plants grown in the United States. The topics discussed include why we prune, how to prune, when and where to prune, special techniques for special purposes, and encyclopedia of plants, from **Abelia** to **Zizyphus**, with pruning instructions; Do's and Don'ts, and a seasonal guide. Recommended to all gardeners.

A MERRY CHRISTMAS HERBAL, by Adelma G. Simmons. William Morrow & Co., 425 Park Ave. So., New York, N. Y. 10016. 1968. Pp. 160. Illus. $5.95. This is a book of lore and legend, decorations and recipes for all who are under the spell of Christmas. The topics discussed include Christmas at Caprilands; Christmas trees; wreaths from the herb garden; Heartha and Huldah; fire and flax; St. Barbara's Day; St. Nicholas' Day; St. Lucy's Day; Christmas Reveillon; New Year's Day; Epiphany; growing the Christmas garden, and herbal gifts from the kitchen and garden.

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ADAPTING NATIVE PLANTS TO GARDEN CONDITIONS

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For many years in Michigan I had practiced ways of moving plants directly from their native "wild" locations to locations within around-the-house flower borders. Such new homes were carefully thoroughly selected and prepared to simulate as closely as feasible conditions to which the plants were accustomed. There was enough success achieved to warrant the continuance of this tedious and exact procedure.

Now that I am in California, I have gone at the problem in a total different way. I now sow seeds and select from the seedlings those plants which indicate a tendency to adapt to the totally different environment, using these selected plants as seed parents for succeeding generations. To date I have had encouraging success with two interesting plants. Seed of both were secured from the Santa Barbara Botanic Garden, Mission Canyon, Santa Barbara, California. My fundamental purpose was to develop additional sources of bright blue color, much needed in California gardens.

Pentstemon azurea. Seed were soaked for six days in a colchicine solution, then sowed in an outdoors bed under a lath and polyethylene film shade. This was done in September; by April of the following year there were seedlings large enough to be spaced out and to be transplanted to varying locations to try to determine if the plant has a noticeable preference for certain exposures and moisture levels. In June of that same year (nine months from sowing) the first flowers showed. From these flowering plants, seed were taken from the one plant which had the most desirable combination of bright blue flowers with a minimum of purple at the base of the tubes, stems which were erect and strong, and a general neatness of clump growth. In late September these seeds were in turn soaked in a colchicine solution for six days, then sowed in similar conditions. From these, one plant with a deep, bright blue flower coloration, which also flowered early, was selected to be a seed parent.

At the present time I have accumulated approximately twenty parent plants, being evaluated further for their ability to withstand the usual garden conditions, which include periods of total neglect. Attrition has been high, and I have not hesitated to rogue out any plants which went loppy or off-color. Two of the plants are low, compact, spreading to twelve-inch diameter neat clumps which flower the entire set of stems at one time. Another, which flowered in early March, flowered again in mid July; its flower stalks had been cut in April, to prevent seed formation.

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Even without further development, I feel that I have a stock of parent plants from which, by asexual reproduction, I can provide considerable quantities of the bright blue color that was needed.

Pentstemon spectabilis. This plant was chosen as a possible source of tall spikes of blue. The same methods were used as with *P. azurea*, as described above, but success was limited. Only one plant remains, the balance having been too rank in growth, with resultant loppiness. Further, only one plant showed what could be classed as "blue", most being a weak lavender or magenta.

Sisyrinchium bellum (Blue-Eyed Grass). After a six-day soak in a colchicine solution, seed were sown in a deeply shaded location outdoors in September. Germination was excellent, and spacing the seedlings was accomplished with very little loss. From June of the next year, to the following June, flowering occurred regularly. Most were small, plain purplish-blue, with scraggly or rank and loppy growth. These were rogued out. One plant of the hundreds grown was saved as a seed parent: it was upright, formed a neat clump, had larger flatter flowers of bright blue. Its first year it flowered from mid-March to early June.

The second year, the parent plant was divided into two smaller clumps, which were planted so that one had morning exposure and one had afternoon exposure. The latter flowered heavier and set more seed. However, with the coming of full summer both plants faltered and dried out by mid-July, indicating that the plant is not yet ready for exposure to so much sunlight and dryness. Seeds taken from these two clumps will be sown in the shade for a repeat of the process.

Iris douglasiana. Per instructions for growing this type of plant, seeds were layered in sphagnum moss in the refrigerator until there were signs of growth. The seeds were sown in different locations, in different soils and with different moisture levels. Of all the many seeds, only one plant survived germination and transplanting operations. This one is tucked into a corner where it sees only morning sunlight, but it just doesn't want to prosper. I intend to try again, with this plant as well as the taller *I. longipetala.*

PRUNUS PERSICA FORMA ZEYLANICA, FORMA NOV.

Prunus persica Batch, forma *zeylanica* Traub, *forma nov.* (Rosaceae), forma tropica, a forma typica speciei enim florens frigus hiemis non imperens; fructo putamente libero, carne cremeo differt. Holonomenifer (typus): No. 1086 (TRA), Jan. 25, 1968, cult. La Jolla, Calif.

A tropical form not requiring a winter cold period for flowering, fruit up to 3.8 x 4.2 cm. in size; free-stone, flesh greenish to cream-colored.—*Hamilton P. Traub*

ELECTRIC DRYING PRESS FOR HERBARIUM SPECIMENS

PHILLIP VAN DER MERWE [1] AND P. J. GROBLER [2]

Government Herbarium, Stellenbosch

In the past various methods were used to speed up the drying for herbarium specimens. Amongst others, ventilated electrical o were used, but without much success as the centre of the press is adequately heated, with a resulting condensation of moisture, which tarded the drying process.

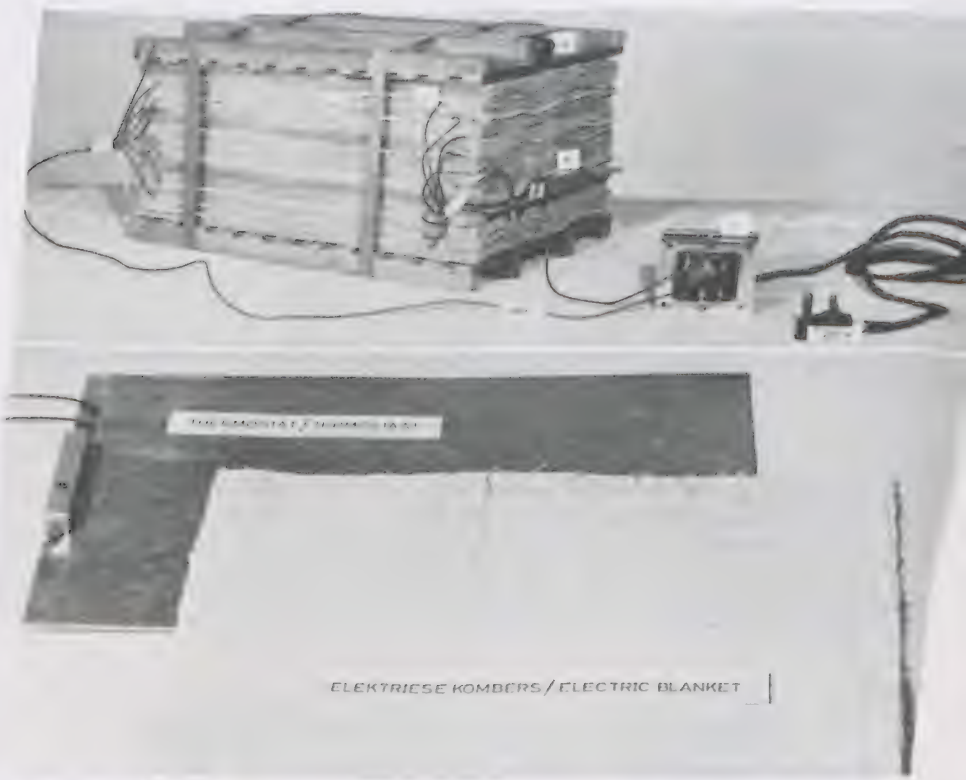

Fig. 25. **Upper,** Electric drying press for drying herbarium specimens: **A,** thermostat, **B,** indicator light, **C,** electric blanket, **D,** transformer (primary 220 V/ secondary 30 V) and **E,** drying paper. **Lower,** electric blanket and thermostat.

[1] *Present Address: Dept. of Nature Conservation, Cape Province, Republic of South Africa.*

[2] *Present Address: National Botanic Gardens of South Africa, Kirstenbosch.*

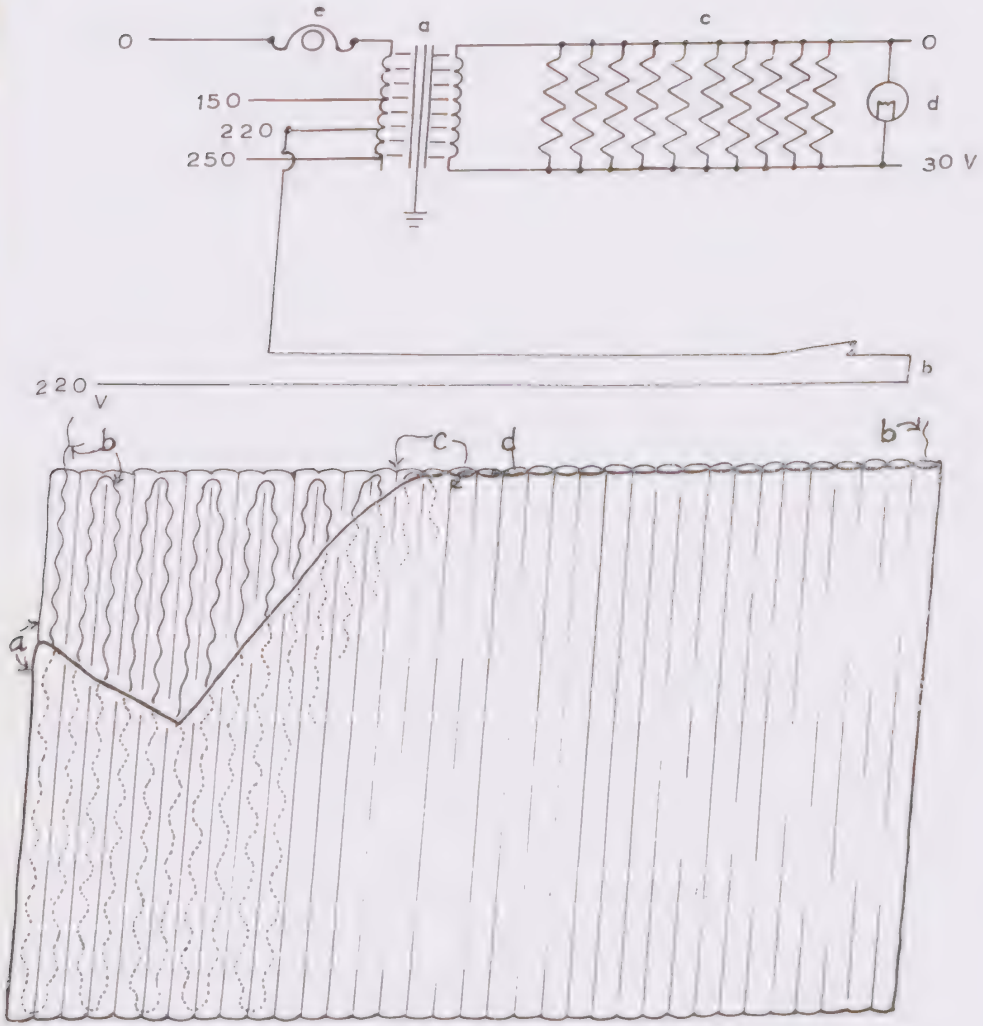

Fig. 26. Electric drying press for herbarium specimens: **Upper,** diagram of wiring of electric press: **a,** transformer; **b,** thermostat; **c,** 220 V/600 W resistance (10); **d,** indicator light; and **e,** fuse.

Lower, electrically heated blanket: **a,** two canvas squares stitched together; **b,** element wire; **c,** stitching; and **d,** parallel openings.

THE CONSTRUCTION OF THE ELECTRICAL PRESS (See Figs. 25 & 26):

The electrical plant press is basically a conventional press with electrically heated blankets (25 x 40 cm.) evenly spaced amongst the normal drying paper.

A thermostat is included in the circuit to regulate the working temperature.

Because open resistance wire is used in close proximity to moist plant material, a transformer is used to bring the 220v current down to 30v—to eliminate any shocks.

A fuse is incorporated to prevent overloading of the transformer. A red indicator light shows the "on" and "off" positions of the apparatus.

Not to curb ventilation in the press, the heating blankets are made of canvas. Each "blanket" is made up of two 25 x 40 cm. canvas squares stitched together in such a way that parallel openings 1 cm. wide are left through which the resistance wire is threaded.

For each blanket, one spiral 600w/220v element wire is used. The spiral is stretched so that a little kink is left in the wire before it is threaded. The kink keeps the canvas apart to facilitate ventilation. Each end of the element is connected to a 30 cm. piece of insulated wire.

Ten electrical blankets (the number depends on the current the transformer can supply) are connected in parallel and connected to the transformer (30v). The primary coil of the transformer is connected to the 220v mains.

An adjustable thermostat, mounted on a stainless-steel sheet of 25 x 43 cm., is connected to the circuit.

The electrical blankets are evenly spaced between the drying sheets of a conventional drying press. The steel sheet with thermostat is placed between sheets 5 and 6, the hottest part, and is set to cut out at 60°C.

EXPERIMENTS WITH THE ELECTRICAL DRYING PRESS:

With the electrical drying press, plants can be dried using one of two methods by either placing the plants in a cold press or into the press already at its working temperature. The last method is important in cases where the leaves tend to drop, as with Erica spp., to kill the plants as soon as possible.

An experiment was conducted to establish the drying speed of the press; on 14th January, 1967, 17 plant species were collected in duplicate and on 15th January, 1967 at 9:00 a.m. one set was placed in a cold electrical press. As a control a duplicate set was placed in an ordinary plant press at 8:00 a.m. on 15th January, 1967.

RESULTS:

The specimens in the above experiment took 23 hours to dry in the electrical press and 116 hours in the conventional plant press.

In the case of the electrical plant press, the laying out and placing the plants in the press and taking them out took 20 minutes and no change of paper was necessary. The laying out and taking out in the

conventional press also took 20 minutes, but an additional 60 minutes was spent in the changing of the wet paper during the drying process.

These specimens were then judged taking into consideration colour, appearance and probable/possible fungal damage. One, two or three points were awarded, depending on the quality of the specimen. The judging was done by three persons independent of each other and in such a way that they were not biased. The specimens dried in the conventional press were awarded 29, 25 and 27 (mean 27) points by the three judges and the specimens dried in the electrical press were awarded 29, 36 and 35 (mean 33) points.

CONCLUSIONS:

According to the judging of the 17 specimens, the electrical press produces as good and even better specimens than the conventional press (mean 33 against mean 27) points.

The higher points were awarded mostly because the better specimens were produced by the fast drying coupled with the heat. Colour reaction was confined to certain spp. with some reacting better to the conventional and others to the electrical drying press.

The considerable saving of time is the greatest advantage of the electrical drying press. The 17 spp. were dried 93 hours sooner than those in the conventional press and required 60 minutes less handling time (drying paper in the electrical press is not changed).

It is expected that more specimens and damp weather conditions would have increased the difference in drying time considerably. With the saving in handling time, more specimens of a better quality can be produced at a great saving in cost per unit.

SUMMARY:

By using electrically heated blankets in a conventional plant press, herbarium specimens of a better quality can be reproduced with less handling and a great saving in time. The necessity to change drying sheets in the press is entirely eliminated and no fungal damage occurs.

APPRECIATION:

1. Prof. P. G. Jordaan, Department of Botany, University of Stellenbosch, Republic of South Africa, is thanked for his encouragement and supplying material and services. 2. Prof. J. T. R. Sim, Department of Pasture/Agronomy, University of Stellenbosch, is thanked for giving consent to build the first electrical press for Departmental use. This made the final improvements possible. 3. The Secretary, Department of Agricultural Technical Services, is thanked for the cash bonus awarded to both authors for developing a time saving apparatus.

PLANT LIFE LIBRARY—continued from page 128.

MACROMOLECULES OF LIVING SYSTEMS—STRUCTURE CHEMISTRY, by Herbert S. Rhinesmith and Luigi A. Cioffi. Reinhold Corp., 430 Park Ave., New York, N. Y. 10022. 1968. Pp. xi + 164. $4.75. The purpose of this book is to present a "macromolecular anato which might be preliminary to a "macromolecular physiology." The to discussed include the origin of living matter; structural units; carbon c pounds; three-dimensional structures; atomic structure; lipids; carbo drates; amino acids; proteins; nucleic acids, and the genetic code. T highly stimulating book is highly recommended to all interested in coming into being of organisms, physiology and biochemistry.

'TORREY CANYON' POLLUTION AND MARINE LIFE, edited by J. Smith. Cambridge University Press, 32 E. 57th St., New York, N. Y. 100 1968. Pp. ix + 196. Illus. $9.50. The whole world was shocked to re about the cargo of 117,000 tons of crude oil which leaked into the sea fro the "Torrey Canyon" for ten days in March of 1967. Enormous quantiti of detergents were applied in the effort to disperse the oil. This in tu had a deleterious effect in poisoning marine life. The latter effect is th subject of this report of the Plymouth Laboratory of the Marine Biologica Assoc. of Britain. The ten-week project is described in detail, includin results from field observations and laboratory experiments. Its great valu lies in the outline of methods for predicting and plotting the movement o oil at sea. Highly recommended to all interested in conservation, includin ecologists and marine biologists.

INTRODUCTORY PLANT SCIENCE, by Henry T. Northen. 3rd edition. Ronald Press, 79 Madison Ave., New York, N. Y. 10016. 1968. Pp. viii + 586. Illus. This third edition of an excellent text on introductory plant science will be welcomed. Its purpose is to present to the beginning student a clear view of the plant world. The topics discussed include plants in human affairs; plant physiology; anatomy; genetics; plant communities; conservation; variation and bioevolution; groups of plants. This outstanding profusely illustrated, easy to read text is highly recommended to all beginning students and amateur plantsmen who wish to take a refresher course in introductory plant science.

PHOTOSYNTHESIS, by G. E. Fogg. American Elsevier Publ. Co., 52 Vanderbilt Ave., New York, N. Y. 10017. 1968. Pp. xii + 116. Illus. $3.95. This balanced, easy to read review of recent discoveries about the mechanism of photosynthesis, and of the wide implications of the subject, will be welcomed by the beginning student. The topics discussed include the nature of photosynthesis; role of chlorophyll, etc.; the supply of light; carbon dioxide and water; the absorption of light; the conversion of light energy; the path of carbon assimilation; the flexibility of photosynthesis and its interrelations with other processes; and photosynthesis and life, past, present and future. This stimulating book is highly recommended to all beginning students.

TAXONOMY OF AMERICAN SPECIES OF LINDEN (TILIA), by G. N. Jones. University of Illinois Press, Urbana, Ill. 1968. Pp. 156. Illus. $5.95. This is a taxonomic monograph on the four American species of Linden (**Tilia**). It includes discussions of the taxonomic position of **Tilia**, generic diagnosis, morphology, chromosomes, hybrids, properties and uses, propagation, geographical distribution, etc. This is followed by the analytical keys to, and detailed descriptions of, the species, including citation of numerous specimens, excellent illustrations, and an adequate index. Recommended to all interested in the American Flora.

CRITICAL REVIEW OF THE GENUS **GALANTHUS** L.

Z. T. Artyushenko.

Komarov Botanical Institute, Leningrad

In a recently published article (Artyushenko, 1966) an attempt was made to appraise the related connections of the representatives of the genus *Galanthus* growing mainly in the Caucasus. The areas of some of the native snowdrops lie outside the Soviet Union. This fact as well as the desire to represent the taxonomy as a whole has compelled us to investigate in greater detail all foreign materials available to us.

To attain these objectives, we tried to make our collection of live specimens of foreign snowdrops as complete as possible, cultivating them along with the snowdrops of our flora. This enabled us to study them under conditions comparable between themselves.

Great assistance in creating such a collection was rendered to me by Elliot Hodgkin, Patrick Synge, Brian Mathew, Frederick Stern and others from England, K. A. Zahariadi from Roumania and D. D. Delipavlov from Bulgaria. I take the opportunity to express my cordial gratitude to all of them for the dispatched plants.

I. PREVIOUS WORK

The first scientist to divide the genus Galanthus into taxonomic groups was Günter Beck von Mannagetta, 1894. In his treatment the genus Galanthus is represented as follows:

I. Rank **NIVALES**

Leaves with prominent rib below, with flat margin:

1. **Galanthus nivalis** L.

This species comprises the following varieties:

Var. 1. **europaeus** G. Beck.

Twenty forms belong to this variety and they differ from each other by the following characters:

(a) by the shape of outer tepals —(1) **stenotepalus** G. Beck, (2) **platytepalus** G. Beck;

(b) by the shape and number of inner tepals—(3) **poculiformis** Hort., (4) **hololeucus** Celak., (5) **hortensis** Herb., (6) **plenissimus** G. Beck;

(c) by the colour of tepals—(7) **albus** Allen, (8) **sandersii** Harpur Grew, (9) **pallidus** Smith, (10) **viridans** G. Beck, (11) **virescens** Leichtl.;

(d) by the flowering period—(12) **aestivalis** Burbidge, (13) **olgae** Orph., (14) **corcyrensis** Hort.;

(e) by the shape of spathe—(15) **candidus** G. Beck, (16) **scharloki** Casp., (17) **cathcartiae** Allen;

(f) other deviations—(18) **biscapus** G. Beck, (19) **biflorus** G. Beck, (20) **trifolus** G. Beck.

Var. 2. **major** Ten.
Var. 3. **caucasicus** Baker.
Var. 4. **redoutei** Rupr.

2. **Galanthus graecus** Orph.

3. **Galanthus elwesii** Hook.

This species comprises the following forms—(1) **typicus**, (2) **maximus** Velen., (3) **reflexus** Herb.

4. **Galanthus latifolius** Rupr.

This species comprises the following forms—(1) **typicus**, (2) **alleni** Baker, (3) **fosteri** Baker.

II. Rank **PLICATI**

Rib not so prominent; leaves plicate on margin.

5. **Galanthus plicatus** M. B.

This species comprises the following varieties:

Var. 1. **genuinus.** This variety comprises the following forms: 1) **typicus**, 2) **excelsior** G. Beck, 3) **maximus** Allen.
Var. 2. **byzantinus** Baker.

6. x **Galanthus valentinei** G. Beck

7. x **Galanthus hybridus** Allen

Among numerous garden forms enumerated by Beck, there are such, which at present are considered as independent species (**G. reginae-olgae, G. corcyrensis, G. fosteri**).

One also cannot agree with the author in considering **G. Caucasicus** as a variety of **G. nivalis**, and in treating **G. byzantinus** as a variety of **G. plicatus.** They are quite independent species.

In 1947 L. M. Kemularia-Natadze published a summary of the taxonomy of Caucasian snowdrops. According to that author, the classification of the genus is as follows:

Sect. I. **Viridifolii** Kem.-Nath.

Leaves not glaucous but green.

Ser. **Woronowii** Kem.-Nath.

Leaves shiny, green, channelled, folded inside with hood on the top: 1. **G. woronowii** Losinsk.; 2. **G. caspius** (Rupr.) Grossh.; 3. **G. valentinae** Panjut.;

Ser. **Latifoliae** Kem.-Nath.

Leaves broad lanceolate, with small hood on the top. No anther apiculus: 4. **G. latifolius** Rupr.

Ser. **Fosteriae** Kem.-Nath.

(not available in the Caucasus)

Ser. **Angustifoliae** Kem.-Nath.

Leaves flat, narrow, matt-surfaced, not glaucous, without hood on the top: 5. **G. lagodechianus** Kem.-Nath.; 6. **G. ketzkhovelii** Kem.-Nath.;

Sect. II. **Glaucaefolii** Kem.-Nath.

Plants glaucous; mark heart-shaped or horseshoe-shaped.

Ser. **Nivales** Kem.-Nath.

Leaves flat, top thickened but without hood: 7. **G. alpinus** Sosn.; 8. **G. caucasicus** (Baker) Grossh.

Ser. **Elwesiae** Kem.-Nath.

(not available in the Caucasus)

Ser. **Plicatae** Kem.-Nath.

(not available in the Caucasus)

Ser. **Schaoricae** Kem.-Nath.

Leaves convolute in vernation, channelled, top with hood: 9. **G. schaoricus** Kem.-Nath.

With such minute division of the genus into sections, any further subdivision into series is not justified. Thus, for example, **G. caspius**, a species close to **G. lagodechianus**, as mentioned by the authors in their study of genetical relations of this latter species, was erroneously included into the series **Woronowii**, whereas the species **G. latifolius** close to the series **Woronowii** is considered as an independent series.

The section **Glaucaefolii**, in addition to the feature of glaucous leaves, is characterized by the presence of a definite shape of a mark which has not been mentioned in the examination of the foregoing section. However, this character varies greatly and the mark of such a shape inherent in the snowdrops of this section can also be found in other species. A photograph (Fig. 27) given as an example illustrates the variability of the mark shape in individuals of **G. caucasicus** gathered from 1 sq.m. in Tbilisi region (Kodzhori) as well as in **G. platyphyllus** collected from 1 sq.m. in Krestovy pass.

Fig. 27. Variability of markings on tepals of two **Galanthus** species: **upper, Galanthus caucasicus; lower, Galanthus platyphyllus.**

It should also be noted that snowdrops classified by the author under the series Nivales are in no way characterized by flat leaves neither in vernation nor in mature state. Their outer leaf embraces the inner one and at least the wider outer leaf in vernation is rather channelled. Species with genuinely flat leaves in vernation and in mature state **G. caspius, G. lagodechianus** and **G. ketzkhovelii**—are classed by Kemularia-Natadze with a different section.

In 1948, Traub & Moldenke published "The Tribe Galantheae", including lineagic treatises of the genera **Galanthus** and **Leucojum.** They divided the genus **Galanthus** into two subgenera: **Eugalanthus** Traub et Mold. and **Plicatanthus** Traub et Mold.

The character of the leaves was chosen as the principal feature for distinguishing the subgenera. The species of the subgenus **Eugalanthus**

are characterized by flat leaves in vernation, with prominent midrib on the lower surface. The following species belong to this subgenus:

1. **G. nivalis** L.; 2. **G. gracilis** Celak; 3. **G. olgae** Orph.; 4. **G. elwesii** Hook; 5. **G. graecus** Orph.; 6. **G. caucasicus** (Baker) Grossh.; 7. **G. maximus** Velen.; 8. **G. perryi** Baker; 9. **G. alleni** Baker; 10. **G. transcaucasicus** Fomin; 11. **G. platyphyllus** Traub et Mold.; 12. **G. fosteri** Baker; 13. **G. cilicicus** Baker; 14. **G. ikariae** Baker.

Species characterized by leaves plicate along the margins belong to the subgenus Plicatanthus. They are as follows: 15. **G. alpinus** Sosn.; 16. **G. plicatus** M.B.; 17. **G. grandiflorus** Baker; 18. **G. woronowii** Losinsk; 19. **G. byzantinus** Baker.

Fig. 28. Folding of leaves in **Galanthus** species: **left, Galanthus plicatus; right, Galanthus ikariae (G. woronowii).**

One cannot agree with the authors in integrating the above-mentioned species into the subgenus **Plicatanthus.** The folding of leaves is inherent in many platyphyllous snowdrops but its origin is dissimilar. Thus, in **G. plicatus** and **G. byzantinus** folding emerges as a result of the turning of the margins toward the lower side and this feature is typical of the two species. As to the folding of leaves in such snowdrops as **G. ikariae (G. woronowii), G. bortkewitschianus, G. alpinus,** it is caused by bending of leaf margins to the upper side, and this feature is generally not constant since it occurs not in all plants (Fig. 28).

The species **G. perreyi** and **G. grandiflorus** are now regarded as cultivated forms.

In 1956 a profusely illustrated monograph by F. C. Stern devoted to the genera **Galanthus** and **Leucojum** was published.

The classification of the genus **Galanthus** according to F. C. Stern is as follows:

Ser. 1. **Nivales** G. Beck

1. **G. nivalis** subsp. **nivalis**; 2. **G. nivalis** subsp. **cilicicus** (Baker) Gottlieb-Tannenhain; 3. **G. nivalis** subsp. **reginae-olgae** (Orph.) Gottlieb-Tannenhain; 4. **G. corcyrensis** (Beck) Stern; 5. **G. rizehensis** Stern; 6. **G. graecus** Orph.

Ser. 2. **Plicati** G. Beck

7. **G. plicatus** M. B.; 8. **G. woronowii** Losinsk; 9. **G. byzantinus** Baker.

Ser. 3. **Latifolii** Stern

10. **G. ikariae** subsp. **ikariae**; 11. **G. ikariae** subsp. **latifolius** Stern; 12. **G. fosteri** Baker; 13. **G. caucasicus** (Baker) Grossh.; 14. **G. elwesii** Hook; 14a. **G. elwesii** var. **maximus** (Velen.) G. Beck; 15. **G. alleni** Baker.

The investigation by L. M. Kemularia-Natadze and a number of other materials concerning the snowdrops of the flora of the USSR were unknown to F. C. Stern as has already been mentioned in the critical review of his work (Artyushenko, 1958). As a result, a number of Caucasian species remained outside the knowledge of F. C. Stern, whereas several species were improperly included in the key (for example: **G. woronowii** is really typical of vernation inherent in species belonging to the series **Latifolii** and not **Plicati**).

Owing to the lack of herbarium specimens and living plants, F. C. Stern had no opportunity to familiarize himself fully with the species. **G. woronowii** and **G. latifolius** all the more that the drawing of **G. latifolius** in "Gartenflora" illustrating this species has been carried out inaccurately—the inner tepals are shown with a sinus at the top and this is not inherent in this species. A number of species described by Y. I. Koss (1951) and Kemularia-Natadze (1947) after the publication of the "Flora of the USSR" comprising the description of snowdrops (Lozina-Lozinskaya, 1935) were unknown to F. C. Stern.

In 1966, Khokhryakov published his taxonomy of the genus **Galanthus** divided into two subgenera on the basis of the following characters:

Subgenus **Grinoides** Khokhr. Bulbus perennis, scapus fistulosus, perigonii phylla interna integra.

Subgenus **Galanthus**. Bulbus biennis, scapus solidus, perigonii phylla interna excisa.

The first two characters cannot be taken as a basis for the detailed classification of the genus from the following considerations:

Species classed by Khokhryakov with the first subgenus—**G. Krasnovii, G. Latifolius (= G. platyphyllus)** and **G. valentinae (= G. krasnovii)** have biennial and not perennial bulbs, i.e. are made up of scales of two last years and of unformed scales of the leaf-bud. The structure of the biennial bulb is given in the "Atlas of descriptive morphyology of higher plants" (Fedorov, Kirpichnikov and Artyushenko, 1962) and illustrated by a drawing.

However, Khokhryakov ignored these data. Such species as **G. caucasicus, G. alpinus, G. lagodechianus** etc. also have biennial bulbs but they are classed by Khokhryakov with an other subgenus which comprises bulbs of an annual cycle—**G. nivalis, G. plicatus, G. graecus, G. elwesii,** etc.

As to the number of scales of the annual cycles, the following can be said. If the number of scales in the annual cycle is more or less definite for the given species, the number of annual cycles may vary, depending on the

change of environmental conditions. With prolonged and cold winter, when metabolism in the bulb is greatly delayed, a greater number of scales is maintained and conversely, with alternating thaws and frosts, the bulbs become considerably exhausted and the number of scales diminishes.

Consequently we consider that the number of annual cycles in the bulb cannot serve as a systematic feature.

Khokhryakov defines the scape as hollow for the first subgenus, whereas the second subgenus is considered as having no cavity. Our study of scapes in all species of **Galanthus** has demonstrated the following. At the first stages of its development its core is filled with colourless parenchyme cells which slime subsequently and a cavity is created inside the scape. No deviations from this type have been observed by us in either of the species.

Consequently, the subgenera are essentially divided on the basis of a single feature, namely, the shape of inner tepals. Sections distinguished by the Khokhryakov are not valid because no characteristics are given for them and there is no justification in discussing the validity of such classification.

The author divides the first section into two subsections, namely, Subsect. **Viridifolii**, green leaves and Subsect. **Glaucifolii**, glaucous leaves. Within the first subsection Khokhryakov distinguishes three series which differ from one another in the width of leaves and the green mark on the inner tepals.

He includes G. fosteri and G. ikariae into the series **Fosteriani. G. Fosteri** actually has a green mark at the base of the inner tepals, whereas no such mark exists in **G. ikariae.** The study of living specimens **G. ikariae** received from England, where they are cultivated in Kew Garden, as well as the description of this species by Baker (1893) and Stern (1956) served as a basis for such a statement.

The series **Alleniani** Khokhr. is characterized by Khokhryakov as follows: "Folia apice albida, obtusata supra glauca infra virida" and he classes with this series such species as **G. alpinus, G. bortkewitschianus, G. schaoricus** which are characterized by leaves glaucous on both sides.

The series **Graeci** Khokhr. is defined as follows: "Folia angusto-lanceolata vel supra glauca". Along with G. graecus characterized by glaucous leaves, the author classes with this series **G. rizehensis, G. cabardensis, G. komuiaria** which have bright green leaves. We do not intend to enumerate all the errors admitted by the author in his system. The examples cited are sufficient to prove that the author's approach to this difficult problem was careless and irresponsible.

His attempt to create taxonomy cannot be regarded as serious. One more factor should be emphasized. As a result of such a useless classification of the genus into intrageneric taxons, the series as presented by Khokhryakov are in most cases represented by one species only. Thus, the author's view is inconsistent with the very idea of distinguishing the groups of related substituting species as suggested by Komarov (1940) and, as a matter of fact, Khokhryakov dissociated the groups of related species contemplated in one of our papers (Artyushenko, 1965).

In examining the phylogeny of the genus **Galanthus**, Khokhryakov is of the opinion that the genus has its origin in the tropical bulbous plants.

In his opinion, they are closest to the species of the genus **Haemanthus**, the most primitive genus of the **Amaryllidaceae**, growing in tropical Africa. Even with most superficial comparison of both genera one may be certain, how different they are in appearance.

The morphological features which characterize the genus **Haemanthus** in no way coincide with the data presented by Khokhryakov. So, in the opinion of Khokhryakov, the principal features which bring closer together the genera **Haemanthus** and **Galanthus**, comprise hollow scapes and free tepals. Actually, however the representatives of the genus **Haemanthus** have no hollow scapes and the tepals are coalescent in the lower part forming a tube. Consequently the features of similarity as presented by Khokhryakov are really distinctive characteristics of these genera.

In addition, a number of essential distinctions are available as well. In **Haemanthus** the filaments are long, adnate to the gorge, often longer than the perianth; small anthers; umbelliformis inflorescence with several free bracts; berry-shaped fruit etc. In snowdrops the flowers are solitary, with two united bracts forming a spathe; very short filaments; stamens halved the length of the perianth; free tepals; capsular fruit etc.

We are of opinion that the evolutionary range **Haemanthus-Galanthus** as suggested by Khokhryakov is not confirmed by facts and is essentially wrong.

II. THE PRESENT GROUPING

An enumeration of characters which should be used as the basis for the taxonomy of the genus **Galanthus** was given in our earlier work (Artyushenko, 1965).

The study of anatomical characters of the leaf structure and of epidermal cells especially, made it possible to distinguish two geographical groups of snowdrops—the group which essentially comprises European species and, partially, Asia Minor species (from western portion of Asia Minor) and that of Caucasian-Asia Minor species.

The division of snowdrops into such groups based on anatomical characters and distinctive characteristics of geographical distribution is corroborated also by morphological features. Thus, in all the species of the first group the leaves are glaucous, whereas the snowdrops of the second group have in most cases bright green leaves without any glaucous bloom. As a rule, the presence of glaucous bloom is peculiar to the plants from drier habitats. As a matter of fact, the climatic conditions of Central and Southern Europe where snowdrops with glaucous leaves grow, are characterized by greater dryness as compared with the Black Sea coast and the Caucasian highlands. The snowdrops with glaucous leaves of the Caucasus are also confined to the drier areas (Stavropol hills, Eastern Georgia).

Moreover, almost all snowdrops of the first group are characterized by flat leaves in vernation, whereas most of the species belonging to the second group have leaves convolute in vernation. Finally, all snowdrops of the European group have chromosome numbers $2n = 24$, whereas typical of the Caucasian-Asia Minor group are chromosome numbers $2n = 24$, 36 and 72.

On the basis of the above-mentioned facts, we consider it possible to assign the taxonomic grade of sections to the group revealed by us.

The recognized groups as well as the key for the identification of species are placed under the adopted sections as given below.

Genus GALANTHUS L.

Typus generis: **Galanthus nivalis** L.

Sect. I. **Galanthus**

Syn.—Reihe **Nivales** Beck, (1894), Wiener Ill. Gartenz., 19: 47 p.p.; Reihe **Plicati** Beck, l.c. 56; Sect. **Glaucifolii** Kem.-Nath. (1947), Tr. Tifl. Bot. sada 2, II: 182 p.p.; Sect. **Viridifolii** Kem.-Nath., l.c. 117, p. min. p.; Subgen. **Eugalanthus** Traub et Mold., (1947), Herbertia, 14: 104 p.p. (excl. nonn. sp. plerumqus caus.); Subgen. **Plicatanthus** Traub et Mold., l.c.: 112, p.p.; Ser. **Latifolii** Stern, (1956), Snowdr. and Snowfl., 20 p.p.

Foliorum epiderma e cellulis elongatis plerumque subrhombeis (non rectangularibus) constans. Species Europae mediae et australis ac partis boreali-occidentalis Asiae Minoris.

Leaves glaucous, epidermal cells tapering to the ends. Species growing in Central and Southern Europe and in the north-western part of Asia Minor.

Typus sectionis—**Galanthus nivalis** L.

1. Inner tepals, with single mark at the top, around the sinus 2
+ Inner tepals, with mark at the sinus and with mark at the base ..4
2. Spring flowering 3
+ Autumn flowering 6
3. Leaves flat in vernation, with flat margins .....1. **G. nivalis** L.
+ Leaves flat in vernation, with margins folded back .....6. **G. plicatus** M. B.
4. Leaves up to 0.7 cm. wide .....4. **G. graecus** Orph.
+ Leaves from 1 to 3 cm. wide 5
5. Outer leaf embraces inner leaf in vernation ....5. **G. elwesii** Hook.
+ Leaves flat in vernation with margins folded back .....7. **G. byzantinus** Baker
6. Flowers appear before leaves .....2. **G. reginae-olgae** Orph.
+ Flowers appear simultaneously with leaves .....3. **G. corcyrensis** (Beck) Stern

1. G. nivalis L.

1753, Sp. Pl. 288. Syn.—**G. nivalis** var. **europaeus** Beck 1894, Wiener Ill. Gartenz., 19: 50.

Bulb 1.5-2 cm. long and 1.2-1.5 cm. wide, sheath 6-9 cm. long. Leaves dark green, glaucous, 8-10 cm. long and 0.4-0.6 cm. wide during flowering, up to 25 cm. long and up to 1 cm. wide after flowering. Scape (7—) 9-12 cm. long; spathe 2.5-3 cm. long; pedicel equal to or longer or shorter than spathe. Outer tepals oblong-obovate, 1.5-2.5 cm. long, 0.7-1.1 cm. wide, inner tepals cuneate, 0.7-1.2 cm. long, 0.4-0.7 cm. wide. Stamens 0.6-0.7 cm. long, anther with an apiculus. Ovary 0.3-0.4 cm. in diameter. (Fig. 29). $2n = 24$ [1]

In low, middle and alpine zones; in the outskirts of forests, in bushes, on free spaces.

Distribution: central and southern Europe, Ciscaucasia.

G. nivalis L. ssp. **angustifolius** (G. Koss) Artyush., **comb. n.** Syn.—**G. angustifolius** G. Koss, 1951, Bot. mat. gerbariya Bot. inst. A.N. SSSR, 14: 134.

This species is distinguished from the basic species by the lesser dimensions of the whole plant; these features are maintained under long cultivation. $2n = 24$.

The northern slopes, at a height of 700 m. above sea level, in bush thickets.

Distribution: Ciscaucasia (Kabardino-Balkarsk Autonomous Soviet Socialist Republic).

2. G. reginae-olgae Orph.

1874 (1876), Atti Congr. Intern. Bot. Firenze, 214. Syn.—**G. olgae** Orph., Boiss., 1884, Fl. Or., 5: 146; **G. olgae-reginae** Hort., 1888, ex Gard. et For. 1: 499; **G. nivalis** f. **olgae** (Boiss.) G. Beck, 1894, Wiener, Ill. Gartenz., 19: 51; **G. nivalis** ssp. **reginae-olgae** (Orph.) Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 32.

Bulb 2 cm. long, 1.5 cm. in diameter; sheath 3-4 cm. long. Leaves green, glaucous, linear, 15 cm. long, 0.6-0.8 cm. wide, appear after flowering (September-October). Scape 9-11 cm. long; spathe 2.5 cm. long; pedicel equal to spathe in length. Outer tepals broad, lanceolate, concave, 2.3-2.5 cm. long and 0.8 cm. wide, inner tepals obovate, with rounded parts of sinuous top, 1.2 cm. long, 0.6 cm. wide. Stamens 0.5-0.6 cm. long, anther with an apiculus. $2n = 24$.

In the outskirts of fir and spruce forests, in ferns.

Distribution: Greece.

[1] Chromosome numbers for snowdrops are given according to L. I. Sveshnikova's data (1965, 1967).

3. G. corcyrensis (Beck) Stern

1956, Snowdr. and Snowfl., 34; Syn.—**G. praecox** Hort., 1891, Allen, Journ. R. Hort. Soc., 13: 180, **nomen nudum**; **G. corcyrensis** Shortt, 1883, Gard. Chron. New Ser., 20: 728, **nomen nudum**; Baker, 1888, Handb. Amaryll., 17, **nomen nudum**; Leichtlin, 1888, in Le Jardin, 2: 139; **G. nivalis f. corcyrensis** G. Beck, 1894, Wiener Ill., Gartenz., 19: 51; **G. nivalis f. corcyrensis** Halaczy, 1904, Consp. Fl. Graec., 3: 206; the same author, 1908, Suppl. N 1: 103; **G. imperati** f. **australis** Zodda, 1904, Fl. Ital. Exicc. N 726.

Fig. 29. **Galanthus nivalis** ssp. **angustifolius** from the suburbs of Nalchik: **right**, general view of the plant; **to side, lower left**, parts of the flower.

Bulb 1.5 cm. long and 1.5 cm. in diameter; sheath up to 4 cm. long. Leaves green, glaucous, linear, with blunt and flat tip, appearing in November simultaneously with flowering; up to 18 cm. long and 0.6 cm. wide. Scape more than 8 cm. high; spathe 3 cm. long; pedicel 2.5 cm. long. Outer tepals narrow, oblong, 2.1 cm. long and 0.9 cm. wide; inner tepals cuneate, 1.1 cm. long and 0.5-0.6 cm. wide, with a green mark around the sinus

at the top. Stamens about 0.5 cm. long, anther with an apiculus. 2n = 2
Native habitat unknown.
Distribution: The islands of Corfu and Sicily.

4. G. graecus Orph.

1884, ex Boiss., Fl. Or., 5: 145; Syn.—**G. nivalis** subsp. **graecus** (Orph. e Boiss.), Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 40 **G. bulgaricus** (Velen. ined. 1886) Velen., 1891, Fl. Bulgar., 539; **G. gracili** Celak., 1891, Sitzungsb. k. Böhm. Ges. Wiss. Math-nat. Cl., 9, 184: 198.

Bulb 1.5 cm. long, 1-1.2 cm. in diameter; sheath 3.5 cm. long. Leaves green, glaucous, always wavy, up to 7 cm. long and 0.5-0.7 cm. wide during flowering. Scape 7-9 cm. long; spathe up to 3 cm. long; pedicel equal to or longer than spathe. Outer tepals obovate, about 2.5 cm. long and 0.7 cm. wide, inner tepals narrow cuneate, 1.1 cm. long, about 0.5 cm. wide. Stamens about 0.7 cm. long, anther with an apiculus. 2n = 24.

In the foothills and mountains, along outskirts of forests and in forests.
Distribution: Greece, Bulgaria, Rumania.

5. G. elwesii Hook.

1875, Curt. Bot. Mag., 101, t. 6166. Syn.—**G. elwesii** var. **whittalii** Arnot, 1898, Gard. Chron., ser. 3, 24: 466.

Bulb 2.5-3 cm. long and 1.8-2.2 cm. diameter; sheath up to 5 cm. long. Leaves green, glaucous, 7-10 cm. long, 1.5-3 cm. wide, with a cucullus on the top. Scape 10-13 cm. long; spathe 3-3.5 cm. long; pedicel 2-2.5 cm. long. Outer tepals broad obovate, about 2 cm. long, 1.3 cm. wide, inner tepals oblong, slightly widening towards the top, 1.1 cm. long, about 0.6 cm. wide, with a green mark around the sinus at the top and at the base. Stamens about 0.7 cm. long, anther with an apiculus. 2n = 24, 48.

Confined to mountain habitats.

Distribution: Europa (Bulgaria, Roumania, Moldavia), Asia Minor and islands in Aegean Sea.

F. Stern recognizes a variety, established by Beck, for the North Greece, Bulgaria and Yugoslavia, attaching to it the following synonimics and features:

G. elwesii var. **maximus** (Velen.) Beck G., 1894, Wiener Ill. Gartenz., 19: 55; Syn.—**G. maximus** Velen., 1891, Fl. Bulgar., 540; **G. graecus** Orph. var. **maximus** (Velen.) Hayek, 1932, Prod. Fl. Balcan., 3: 102.

This variety distinguishes from G. elwesii by waviness of leaves, inherent to G. graecus, and by leaves from 1 cm. to 1.5 cm. wide, rarely 2 cm. wide. The study of this variety in nature has shown that a series of transition forms is available from the typical **G. elwesii** to **G. graecus.** This circumstance allows to assume that **G. elwesii** var. **maximus** is a hybrid between the two mentioned species. It is envisaged to study this problem thoroughly in future (in collaboration with D. D. Delipavlov).

6. G. plicatus M. B.

1819, Fl. Taur.-Cauc., 3: 225. Syn.—**G. nivalis** subsp. **plicatus** (M. B.) Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 35; **G. latifolius** Salisb., 1866, Gen. Pl. 95, non Rupr.; **G. plicatus** var. **excelsior** G. Beck, 1894, Wiener Ill. Gartenz., 19: 57.

Bulb 2-3 cm. long, 2-2.8 cm. in diameter; sheath 4-6 cm. long. Leaves green, glaucous, linear, with margins folded back and flat against each other in vernation, 8-12 cm. long and 0.4-0.8 cm. wide during flowering. Scape 12-16 cm. long; spathe 3-5 cm. long; pedicel 2.5-3.5 cm. long. Outer tepals broad elliptical, spoon-shaped, tapering to the base, 2.5-3 cm. long, 1.8-1.5 cm. wide, inner tepals cuneate, 1-1.1 cm. long and 0.8-1 cm. wide, with a green mark around the sinus at the top. Stamens 0.7 cm. long, anther with an apiculus. 2n = 24.

In foothills and mountains, in the outskirts of forests, in bushes.

Distribution: Roumania, Moldavia, the Crimea.

7. G. byzantinus Baker

1895, Gard. Chron., Ser. 3, 13: 226. Syn.—**G. plicatus** var. **byzantinus** (Baker) G. Beck, 1894, Wiener Ill. Gartenz., 19: 57; **G. nivalis** subsp. **byzantinus** (Baker) G. Beck; Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 41.

Bulb 2 cm. long and 2.5 cm. in diameter; sheath 8 and more cm. long. Leaves green, glaucous, lanceolate, with margins folded back and flat against each other in vernation. Scape 11 cm. long; spathe 4 cm. long; pedicel 3 cm. long. Outer tepals broad elliptical, spoon-shaped, tapering to the base, 2.2 cm. long and 1.2 cm. wide; inner tepals cuneate, 1.1 cm. long, with a mark at the top around the sinus and at the base. Stamens 0.8 cm. long, anther with an apiculus. $2n = 24$.

Open, sodded places, in bushes.

Distribution: Asia Minor: Bosporus, Asian coast, Göksu.

Sec. 2. **Viridifolii** Kem.-Nath.

1947. Tr. Tifl. Bot. sada, Ser. 2, 11: 177. emend. Artyush., hoc loco.

Syn.—Reihe **Nivales** G. Beck, 1894, Wiener Ill. Gartenz., 1947, p.p.; Sect. **Glaucifolii** Kem.-Nath., l.c. 182, p. min. p.; Subgen. **Plicatanthus** Traub et Mold., 1947, Herbertia, 14: 112.; Subgen, **Eugalanthus** Traub et Mold., l.c., 104, p. min. p.; Ser. **Latifolii** Stern, 1956, Snowdr. and Snowfl., 20, p.p.

Foliorum epiderma e cellulis rectangularibus constans. Species Caucasi et Asiae Minoris /parte euis boreali-occidentali exclusa/.

Leaves glaucous, shiny or matt-surfaced, with rectangular epidermial cells. These snowdrops grow in the Caucasus and Asia Minor, with the exception of the north-eastern part of the latter.

Lectotypus sectionis **G. platyphyllus** Traub et Mold. (Syn.—**G. latifolius** Rupr.)

1. Leaves unglaucous 2
\+ Leaves glaucous 8
2. Leaves flat in vernation 3
\+ Outer leaf embraces inner leaf in vernation 5
3. Leaves bright green ..... 10. **G. lagodechianus** Kem.-Nath.
\+ Leaves dull but without glaucous bloom 4
4. Outer tepals about 2 cm. long ..... 9. **G. cilicicus** Baker.
\+ Outer tepals from 2 to 2.5 (3) cm. long ..... 8. **G. transcaucasicus** Fomin.
5. Inner tepals with a sinus at the top 6
\+ Inner tepals without a sinus at the top 7
6. Inner tepals with a green mark only under a sinus ..... 4. **G. ikariae** Baker.
\+ Inner tepals with a green mark under a sinus and at the base ..... 7. **G. fosteri** Baker.
7. No anther apiculus; inner tepals with a rounded top ..... 5. **G. platyphyllus** Traub et Mold.
\+ Anther with an apiculus; inner tepals with a rounded or obtuse top ..... 6. **G. krasnovii** Khokhr.
8. Leaves 2-2.5 cm. wide 9
\+ Leaves 1-1.6 cm. wide, as a rule ..1. **G. caucasicus** (Baker) Grossh.
9. Flowers up to 1.5 cm. long; fruits not developed ..... 3. **G. bortkewitschianus** G. Koss.
\+ Flowers from 1.5 to 2 cm. long; fruits developed 2. **G. alpinus** Sosn.

1. G. caucasicus (Baker) Grossh.

1924, Pl. Or. Exsicc., Fasc. 1:4. Syn.—**G. nivalis** ssp. **caucasicus** Baker, 1887, Gard. Chron., Ser. 3, 10: 313; **G. nivalis** f. **major** (Redoute) Rupr., 1868, Gartenfl., 17: 131.

Bulb 2.4-4 cm. long, 1.5-2 cm. in diameter; sheath /2/ 4.5-5.5/8/ cm. long. Leaves dark-green, glaucous, linear, /2/ 4-6.5 /8/ cm. long and 1 cm. wide during flowering, /10/ 12-15 /18/ cm. long and 1-4 cm. wide after flowering, with a nearly flat top. Scape 5-6 cm. long; spathe 2.5-3.5 cm. long; pedicel slightly shorter than spathe. Outer tepals concave, obovate /1.5/ 1.7-2 cm. long, 0.8-1 /1.2/ cm. wide; inner tepals cuneate, 0.8-0.9 cm. long and 0.5-0.6 cm. wide, with a mark around the sinus at the top. Stamens 0.6-0.7 cm. long, anthers with a small mucronatum. Ovary 0.3-0.7 cm. in diameter (Fig. 30, left and upper center). $2n=24$.

In mountain forests of middle and low zones.

Distribution: The central Transcaucasia /district of Tbilisi/, the western zone of Ciscaucasia /district of Stavropol/.

2. G. alpinus Sosn.

1911, Vestnik. Tifl. Bot. Sada, 19: 28. Syn.—**G. schaoricus** Kem.-Nath., 1947. Zam. po sist. i geogr. rast., 13: 6.

Bulb 2.0-2.5 /3.5/ cm. long and 1.5-2 cm. in diameter; sheath 3.5-6 cm. long. Leaves dark-green, glaucous, broad lanceolate, /4/ 5-5.5 /7/ cm. long and 1.5-1.8 cm. wide during flowering, up to 25 cm. long and 2-2.5 cm. wide after flowering. Scape 6-9 cm. long, with fruits 12-14 cm. long; spathe 3.5-5 cm. long; pedicel slightly shorter than spathe. Outer tepals concave, obovate, 1.5-2 cm. long and 0.8-1 cm. wide; inner tepals cuneate, 0.8-0.9 cm. long, 0.5-0.6 cm. wide, with a sinus at the top and with a green mark around the sinus. Stamens 0.6-0.7 cm. long; anthers with small mucronatum. Ovary 0.5 cm. in diameter. $2n=24$.

From low to alpine zones, in bushes thinned as a result of sheepherding, on exposures of limestone rocks, in alpine pasturable meadows.

Distribution: The western Transcaucasia, district of the Shaorsky reservoir; the south-western part of the Transcaucasia, districts of Borzhomi, Bakuriani, Keda.

3. G. Bortkewitschianus G. Koss

1951, Bot. mat. gerbariya Bot. inst. A.N. SSSR, 14: 130.

Bulb 3-4 cm. long, 2-3 cm. in diameter; sheath 3-6 cm. long. Leaves dark-green; glaucous, lanceolate, from 2.5 to 6 cm. long and 1.2-1.4 cm. wide during flowering; up to 30 cm. long and 2.5 cm. wide after flowering. Scape 4-6 cm. long; spathe 2.5-4 cm. long; pedicel equal to or slightly longer than spathe. Outer tepals concave, obovate, 1.5 cm. long and 0.8-1 cm. wide; inner tepals cuneate 0.8-0.9 cm. long, 0.5-0.6 cm. wide, with a sinus at the top and with a green mark around the sinus. Stamens 0.6-0.7 cm. long; anthers with small mucronatum. Ovary 0.3-0.4 cm. in diameter. $2n=36$.

The plant grows under the cover of beech forest, on loose humus soils.

Distribution: Ciscaucasia, upper reaches of the river Kamenka, where an area of 5-6 hectares is occupied by this species; the plant is not found in other places.

4. G. ikariae Baker

1893, Gard. Chron., Ser. 3, 13: 506. Syn.—**G. woronowii** Losinsk. 1934, Flora USSR, 4: 794; **G. ikariae** subsp. **ikariae** Stern, 1956, Snowdr. and Snowfl., 48.

Bulb 2-3 cm. long and 2-2.5 cm. in diameter; sheath 2-5 cm. long. Leaves 12-16 cm. long, 1-2 cm. wide, during flowering, 18-22 cm. long after flowering, bright-green, with yellowish hue, glossy, slightly coiled. Scape 10-15 cm. long; spathe 2.5-4.5 cm. long; pedicel 2-3 cm. long. Outer tepals obovate, slightly concave, 1.5-2.4 cm. long, 0.8-1.0 /1.2/ cm. wide; inner tepals oblong, widening toward the top, 0.8-1.0 cm. long and 0.4-0.5 cm. wide, with a sinus and a green mark at the top. Stamens 0.6-0.7 cm. long, anthers with mucronatum at the top. Ovary 0.3-0.5 cm. in diameter. (Fig. 30, right, and lower center). $2n=24$.

Fig. 30. **Galanthus caucasicus** from the suburbs of Tbilisi **left**, general view of the plant; **upper center**, parts of the flower.
Galanthus ikariae (G. woronowii) from the suburbs of Sukhumi: **right**, general view of the plant; **lower center**, parts of the flower.

In forests on foothills, on the Black Sea coast of the Caucasus the plant grows together with **G. krasnovii.**

Distribution: The western Transcaucasia—from Tuapse to Batumi, the eastern part of the Black Sea coast of Turkey, the island of Ikaria.

5. G. platyphyllus Traub et Mold.

1947, Herbertia, 14: 110; **G. latifolius** Rupr. 1868, Gartenfl. 17: 130; **G. ikariae** subsp. **latifolius** Stern, 1956, Snowdr. and Snowfl., 50.

Bulb 4-5 cm. long and 2.5-3 cm. in diameter, sheath 3-5 cm. long. Leaves dark-green, shiny, 15-16 cm. long and 1-1.5 cm. wide during flowering, 20-25 cm. long and 3-3.5 cm. wide after flowering. Scape 10-15 /20/ cm. long, 20-22 cm. long after flowering; spathe 3-5 cm. long; pedicel 1.5-2 cm. long. Outer tepals elliptical or oblong-ovate, 1.8-2.7 cm. long, 0.8-1.5 cm. wide, with an apiculus at the top; inner tepals obovate 0.8-1 cm. long and 0.5 cm. wide, without a sinus at the rounded top, with a green mark of indefinite shape. Stamens 0.4-0.5 cm. long, without an apiculus at the top; ovary 0.3-0.4 cm. in diameter. $2n = 24$.

In subalpine and alpine zones, snowdrops descend sometimes along slopes into gorges.

Distribution: western part of the Greater Caucasus from Gagry range in eastern direction to places slightly eastwards of the Krestovy pass.

6. G. krasnovii Khokhr.

1963, Bull. Mosk. obstsch. ispyt, prir., 63, 4: 140; Syn.—**G. valentinae,** 1940, Fl. Kavkasa, 2: 194.

Bulb 2-2.5 (3.5) cm. long, 2-2.5 cm. in diameter; sheath (2.5) 6-9 cm. long. Leaves 10-18 cm. long, 1-2 cm. wide during flowering, bright-green, glossy, slightly coiled. Scape 12-15 cm. long, up to 30 cm. long after flowering; spathe 2.5-4 cm. long, with slightly expressed green keels; pedicel 2-3 cm. long. Outer tepals obovate, slightly concave, 1.5-2 /3/ cm. long, 0.8-1.2 cm. wide, inner tepals lanceolate, 1-1.5 cm. long, 0.4-0.6 cm. wide, with an obtuse or acuminate top and with a diffused green mark at the top. Stamens 0.5-0.7 cm. long, anther with an apiculus. Ovary 0.4-0.5 cm. in diameter. $2n = 24$.

In beech, hornbeam and mixed forests, in glades, on the floors of damp gorges.

Distribution: the Caucasus—the Black Sea coast of the Caucasus (from Novy Afon to Batumi); Turkey-Artvin district.

7. G. fosteri Baker

1889, Garden Chron., Ser. 3, 5: 458; Syn.—**G. latifolius** Rupr. f. **fosteri** (Baker) G. Beck, 1894, Wiener, Ill. Gartenz., 19: 56.

Bulb 2.5 cm. long, 2 cm. in diameter; sheath up to 5 cm. long. Leaves dark-green, 15-17 cm. long and 1.7-2.6 cm. wide, turned back, with a flat top. Scape up to 9 cm. height; spathe 6 cm. long; pedicel up to 3.6 cm. long. Outer tepals oblong-obovate 2.6 cm. long, 1.2-1.5 cm. wide, inner tepals oblong-obcuneate, 1.2 cm. long, 0.6 cm. wide, with a green mark around a sinus at the top and at the base. Stamens about 0.6 cm. long; anther with an apiculus. $2n = 24$.

In foothills and mountains, in the outskirts of forests, in bushes.

Distribution: Turkey and Lebanon.

8. G. transcaucasicus Fomin

1907, Opred, rast. Kavkasa i Kryma, 1: 281; Syn.—**G. nivalis** f. **caspius** Rupr., 1868, Gartenfl., 17: 132; G. caspius (Rupr.) Grossh., 1928, Flora Kavkasa, 1: 244.

Bulb 1.5-2 (2.5) cm. long, 1.2-1.5 cm. in diameter. Sheath 4-6 /8/ cm. long. Leaves dark-green, matt-surfaced, but without waxy bloom, linear,

10-14 cm. long and 0.5-1 cm. wide during flowering, 20-25 cm. long and 1.2-2.2 (2.5) cm. wide after flowering. Scape 8-10 (13) cm. long; spathe 2.5-3 cm. long; pedicel equal to or slightly longer than spathe (in rare cases shorter than spathe). Outer tepals obovate, 1.5-2.5 /3/ cm. long and 0.7-1 cm. wide, inner tepals 0.8-1 cm. long, 0.5-0.6 cm. wide, with a green mark around a sinus at the top. Stamens 0.6-0.7 cm. long, anthers with an apiculus at the top. Ovary 0.3-0.5 cm. in diameter. $2n = 24$.

In the forests of foothills.

Distribution: the Caucasus-Talysh mountains, The Lesser Caucasus.

9. G. cilicicus Baker

1897, Gard. Chron., Ser. 21: 214. Syn.—**G. nivalis** subsp. **cilicicus** (Baker) Gottlieb-Tannenhain, 1904, Abh. Zool.—Bot. Ges. Wien, 2, 4: 33; **G. rizehensis** Stern, 1956, Snowdr. and Snowfl., 37; **G. glaucescens** Khokhr., 1966. Bull. GBS., 62: 62.

Bulb 1.5-2.2 cm. long and 2 cm. in diameter; sheath 4-6.5 cm. long. Leaves dark-green, matt-surfaced, but without glaucous bloom, linear, 10-12 cm. long, and 0.4-0.5 cm. wide during flowering, and 20-25 cm. long and up to 1 cm. wide after flowering. Scape 12-18 cm. long; spathe 2.5-3 cm. long; pedicel equal to or longer than spathe. Outer tepals oblong-oval, tapered to the base, 1.9-2.1 cm. long, 0.6-0.8 cm. wide, inner tepals oblong, widened at the top, 0.9-1 cm. long 0.4-0.6 cm. wide, with a green mark around a sinus at the top. Stamens 0.7 cm. long, anther with an apiculus. Ovary 0.5 cm. in diameter. $2n = 24, 36$.

In foothills and mountains, in the outskirts of forests, in bushes.

Distribution: Asia Minor—district of Trabson and Cilicia, the Caucasus (suburbs of Batumi).

10. G. lagodechianus Kem.-Nath.

1947. Zam. po sist. i geogr. rast. instituta bot. A. N. Gruz. SSR. 13: 5. Syn.—**G. ketzkhowelii** Kem.-Nath., 1947, Tr. Tbil. Instituta bot., Ser. 2, 11: 181; **G. cabardensis** G. Koss 1951. Bot. mat. gerbar. bot. Instituta A. N. SSSR, 14: 133; **G. kemulariae** Kuth., 1963, Zam. po sist. i geogr. rast. Instituta bot. A. N. Gruz. SSR, 23: 128.

Bulb 2.5-3 cm. long and 1.5-2 cm. in diameter; sheath 4-6 (9) cm. long. Leaves flat, dark green, shiny, without glaucous bloom, linear; 10-12 cm. long and 0.6-0.8 cm. wide during flowering; after flowering 20-30 (45) cm. long and 1-1.5 cm. wide. Scape (3) 8-10 cm. long; spathe 3-4 cm. long; pedicel equal to or slightly shorter than spathe. Outer tepals obovate, (1.5) 2-2.5 (3) cm. long and 0.8-1 cm. wide; inner tepals cuneate, 0.8-1 (1.2) cm. long and 0.4-0.6 cm. wide, with a sinus at the top and a green mark around it. Stamens 0.6-0.8 cm. long; anthers with an apiculus on the top. Ovary 0.4-0.5 cm. in diameter. $2n = 24$.

From subalpine to lower forest zone.

Distribution: the Caucasus—Greater Caucasus (regions of Nalchik, Ordzhonikidze, Khasavyurt, Lagodekh, Zakataly, Nukha, vicinity of Tbilisi—monastery Zedazeni).

As regards the origin of the species belonging to the genus Galanthus, the following can be said. The most likely assumption suggested by F. C. Stern (1949, 1956) is that the genus Galanthus has emerged from an ancestral group common to the genus Leucojum which was confined to the Northern and Central Europe, but shifted to the south (Spain, Portugal, North Africa) and east (The Caucasus, Asia Minor) under the effect of glaciation. From this ancestral group the genus

Leucojum has emerged in the western part of the Mediterranean area and the genus Galanthus—in the eastern part of the latter.

This view is confirmed by chromosome number data. In the genus Leucojum the series of basic chromosome numbers is from 7 to 11 and the basic number in snowdrops continues the ascending series.

The evolution of the genus Galanthus can be represented as follows. We consider the most ancient group of snowdrops as constituted by species from the section Nivales characterized by flat leaves in vernation, epidermal cells tapering to the ends and large cavities in the leaves. All these features are also inherent in the species of the genus Leucojum, whose areas alternate with those of some of the snowdrop species.

The representatives of the section Viridifolii are characterized by rectangular epidermal cells, some of the species have no clearly defined cavities in the leaves; vernation within the section is of two types, but species with vernation inherent in snowdrops of the series *Latifolii* are predominant. The polyploid series 2n=24, 36, 72 is especially noteworthy for this section.

The presence of polyploids in the section is in itself a sufficient proof that this is a younger group of snowdrops. It should be noted that in the Caucasus the species with chromosome numbers equal to 36 and 72 are confined to the Greater Caucasus which was affected by considerable glaciation in the Quaternary period, whereas the lowlands of Kolkhida were not affected by glaciation. And it is there that the most ancient snowdrops such as *G. ikariae* have been preserved.

We do not attach evolutionary significance to the feature of presence or absence of waxy bloom on the leaves as assumed by Kemularia-Natadze (1947). Rather this is a feature of ecological importance inherent in drier habitats of snowdrops more exposed to sun.

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LATIN AMERICAN AMARYLLIDS, 1969

PEDRO FELIX RAVENNA, *Argentina*

Amaryllis aviflora Ravenna, Sellowia 19: 25. 1967. (subgen. *Omphalissa*). Plant about 40 cm high. *Bulb* nearly globose, 6 cm wide, prolonged in a neck about 2-3 cm long. *Leaves* 2-6 at flowering time or serotine, green, somewhat flaccid, about 38 cm long, 3-4 cm wide, somewhat canaliculate down to the base, nearly flat upwards. *Scape* cylindric, lateral, about 6-11.5 mm wide, with dry spathe-valves at anthesis. *Flowers* horizontal or cernuus, about 9 cm long, nearly 6.5-7 cm in diameter, whitish with green throat and red nerves inside. *Ovary* oblong about 11.5 mm long, 7.2 mm wide. *Tepals* connate about 14 cm, the outer ones about 7.5 cm long and 2-2.2 cm wide, somewhat reflexed at the apex, the inner lateral nearly oblanceolate, about 6.7 cm long, 13 mm wide, curved outwards, the lower outer pair contiguous to the lower inner, this much smaller than the others, appressed to the fascicle of stamens. *Filaments* ascendent, curved upwards, whitish. *Anthers* versatile reniform after dehiscence, about 5 mm long; pollen pale yellow. *Style* declinate-ascending about 10 cm long; stigma shortly trifid, lobes about 2.5 mm long.

Hab. and exsiccata: Cultivated in Buenos Aires from bulbs collected by Lic. E. Nicora between Trancas and Rosario de la Frontera, province of Salta (Argentina); flowered Oct. 1962; leg. Ravenna 148 (type in Herb. Ravenna).

A very pretty species similar to *Amaryllis maracasa* Traub; however, this has orange or brick-red flowers. It has also some resemblance to *A. calyptrata* Ker-Gawl., differing by the disposition of the lower tepals (two of the outer and the lower inner), which in *A. aviflora* are contiguous.

The use here of the name *Amaryllis* instead of *Hippeastrum* (synonym) agrees with the 13th article of the International Code of Nomenclature. The existence of an unannoted African specimen (*Brunsvigia rosea*) in the Clifford Herbarium does not affect the Linnean concept in considering the American species *Amaryllis belladonna* Linn. (syn. *Hippeastrum equestre* Herb.) as the type of the genus *Amaryllis*. Any attempt to select a lectotype which could be at variance with the Linnean opinion goes against the 8th article of the mentioned Code. Actually the work "Hortus Cliffortianus" of the famous botanist is not based only on that herbarium, but includes many other species, and among them our American species.

In the last edition (1966) of the Code of Nomenclature, is published the name *Hippeastrum* Herb. (1821) against *Leopoldia* Herb. (1821, nom. prov.); hereby must be understood that the former appears as valid rather than the latter, but even so, the status of the earlier name *Amaryllis* Linn. is not affected.

Amarryllis angustifolia (Pax) Traub et Uphof. Pax says at the end of the original description, that it is intermediate between the sub-

genera *Omphalissa* and *Habranthus* (the latter is considered as a different genus). Traub and Moldenke (1949) include it in the subgenus *Lais*. This is in disagreement with the flower characters. In fact the very narrow tepals, the lower embracing the stamens near the base, these very long and prominent, are evidence enough supporting the transference of the species to the subgenus *Omphalissa*. The inflorescence has four to nine magnificent red flowers, very similar in shape to those of *Sprekelia formosissima*. *Sprekelia spectabilis* Hoehne is a synonym which proves the existence of it also in Brazil. *Hippeastrum rutilum* in the sense of Hassler and Chodat (Bull. Herb. Boiss. ser. 2, 12: 1101. 1903) is also the same still not reported to Paraguay.

Zephyranthes flavissima Ravenna, Sellowia 19: 28. 1967. (subgen. *Zephyranthes*). Plant about 10-20 cm high. *Bulb* ovoid about 16-17 mm long, 13-14 mm wide, prolonged in a neck about 35-40 mm long. *Leaves* often two at flowering time, bright green somewhat thick, nearly flat in the adaxial face, about 12-18 cm long, 2-2.3 mm wide. *Scape* about 7-18 cm long. *Spathe* somewhat reddish, tubular downwards, fenestrated near the apex, about 17 mm long. *Flower* widely funnel-shaped, intensely yellow, pedicellate (pedicel about 11 mm long), nearly 3.5-4 cm in diameter. *Ovary* obovoid, green, about 2.9 mm long, 2 mm wide. *Tepals* oblanceolate-spathulate or oblanceolate, connate about 1.9 mm, the outer about 2.4 cm long and 7 mm wide, the inner about 2.3-2.35 cm long, 6.1 mm wide. *Filaments* somewhat broadish, sepalines about 9.9 mm long, petalines about 11.5 mm long. *Style* erect, straight, as long as the stamens or somewhat longer; stigma capitate, obscurely trilobed.

Habitat.—Stony grassy fields on Serra da Rocinha (Brasil, R. G. do Sul), about 1060 m over sea level; Serra do Oratorio, Santa Catarina, about 1440 m; also in Entre Ríos, Argentina, on stony banks of the river Uruguay, near the water or covered with it (at Parque Rivadavia, near Concordia), and in the prov. of Corrientes and Misiones.

Hab.—Stony grassy fields of the Rocinha mountains (Rio Grande do Sul, Brazil), about 1060 m above sea level; also in the Oratorio Mountains in Santa Catarina, about 1440 m and in the State of Paraná; in the province of Entre Ríos, Argentina, among stones near or under the water at the river Uruguay banks, in the Rivadavia Park near Concordia; also in the provinces of Corrientes and Misiones.

Zephyranthes stellaris Ravenna, Sellowia 19: 28. 1967. (subgen. *Zephyranthes*). Plant about 17 cm high. *Bulb* ovoid, about 20 mm long and 14-15 mm wide or smaller, covered with dull ochraceous coats. *Leaves* suberect, green, nearly filiform or very slightly canaliculate, smooth, about 17 cm long and 1.15 mm wide. *Scape* about 17 cm long. *Spathe* tubular 1-valved, undivided to the apex, 1-flowered, about 14-18 mm long. *Flower* white, greenish at the base, rotaceous, about 4 cm in diameter. *Tepals* oblanceolate, connate about 0.8-1 mm, the outer about 25.5 mm long, 7.6 mm wide, the inner about 24 mm long, 8 mm wide. *Filaments* nearly erect three about 8 mm long, the other three

nearly 9.9 mm long. Anthers nearly straight after dehiscence, or somewhat curved, about 3 mm long. *Style* ascendent about 11 mm long; stigma capitae-trilobed. Related to *Zephyranthes candida*. People know it as "vivina"; bulbs are supposed to be edible.

Hab.—In damp grassy places among *Prosopis*, in the Argentinean provinces of Entre Ríos, Santa Fé and Misiones; also in Paraguay near Villa Rica.

Bulbs of this species were taken from some "dry" specimens which were covered with poison two years before. One of these flowered after several months. By the shape of its perigonium, anthers and stigma, it rather resembles *Z. candida*. It is easily distinguishable by its nearly filiform leaves and the very weak habit of the whole plant. According to the collectors the bulbs are edible.

Zephyranthes filifolia Herbert ex Kraenzlin. According to Baker (1888) the name *Zephyranthes filifolia* was proposed by Herbert, but never published. The first description with that name was made by Kränzlin using a specimen from northern Patagonia (at Kew). In fact the species was recently re-collected in the province of Río Negro. However, it has a much wider distribution to the north, through the provinces of La Pampa, Buenos Aires, Mendoza, Córdoba, San Luis and Catamarca. Therefore it seems necessary to draw its geographical distribution by means of the specimens determined by me.

Habranthus andalgalensis Ravenna, Sellowia 19: 30. 1967. Plant about 23-25 cm high. *Bulb* nearly globose or globose, about 27 mm wide, covered with dark tunics, these prolonged in a neck. *Leaves* 3-4 at floweringtime, or none, filiform, ash green, narrowly canaliculate, about 15-20 cm long, 2 mm wide. *Scape* cylindric, weak, about 12-13 cm long. *Spathe* 1-valved, 1-flowered; valve membranaceous, very often undivided, about 3 cm long, tubular downwards for 5-10 mm. *Flower* cernuus pedicellate (pedicel about 6-12 mm long), whitish, about 4.5 cm long, 3-4 cm in diameter. *Ovary* oblong, about 4.7 mm long and 2.5 mm wide. *Tepals* oblanceolate, somewhat connate at the base, the outer about 44 mm long, the inner about 42.5 mm long, nearly 11.5 mm wide. *Stamens* fascicled, declined, the shorter pair about 13 mm long, the longer pair nearly 23 mm long, the intermediate ones about 19 mm and 21 mm long; anthers curved semilunate, about 3 mm long. *Style* declinate about 28 mm long; stigma shortly trifid, lobes about 1.6 mm long recurved at the apex.

Hab.—In sandy places among prickly bushes near Andalgalá (prov. of Catamarca, Argentina), in a place known as La Aguada.

This species resembles somewhat *H. gracilifolius* Herb. It can be easily identified because of the narrowly channeled grayish leaves, which frequently appear at the same time as the flowers. These are whitish, not pink. The range and habit of both are quite different.

Habranthus magnoii Ravenna, Sellowia 19: 31. 1967. Plant about 20 cm high. *Bulb* ovoid or nearly ovoid, about 3 cm long, 2 mm wide, or smaller, covered with dark coats. *Leaves* serotine, somewhat firm in texture, flat, not canaliculate, obtuse, about 20-25 cm long, 5-7 mm

wide. *Scape* about 9-10 cm long. *Spathe* 1-flowered, bifid at the apex, about 3 cm long. *Flower* pink, greenish downwards, about 4-5 cm long, 3.5 cm in diameter. *Tepals* oblanceolate slightly connate at the base, the outer about 45 mm long, 6-8 mm wide, the inner nearly of the same length as the outer. *Filaments*, petalines about 25-28 mm long; anthers lunulate about 2.5-3 mm long; pollen yellow. *Ovary* obovoid, about 2.7-3.2 mm long, 2-2.5 mm wide; style about 4 cm long; stigma trifid, its lobes about 2.5 mm long.

Hab.—Among rocks or stones in the mountains of the province of Córdoba (Argentina).

Habranthus magnoii is related to *H. brachyandrus* (Bak.) Sealy, and also to *H. robustus* Sweet. The former has larger flowers with a purple base. The latter is a native of the Island of Santa Catarina (State of S. C., Brazil) and neighbouring island. Named in honor of S. Magno, painter and naturalist.

Habranthus robustus Herb. The geographical range of this species has not been cleared up till now. According to Herbert, the bulbs were found in the neighbourhoods of Buenos Aires. The only species, which for a long time made me hesitate, is the native of the province of Córdoba, which I have named *Habranthus magnoii*.

Habranthus robustus was synonymized by Traub under *H. tubispathus* (L'Hér.) Traub, but this is a smaller different species which grows really not far from Buenos Aires. On the other hand, Cabrera (see Man. Fl. Alr. Buenos Aires: 148. 1953) calls *H. robustus* another species which has about three flowers in each umbel.

Our species is frequent in the rocky hills of the island of Santa Catarina (S. C., Brazil), for example Morro das Pedras and also in the neighbouring islands. I found it cultivated at Sta. Ana (Misiones), Argentina. The mentioned region of Brazil was explored by Tweedie the Scottish collector, during the years 1824 and 1825; it is proved that several plants collected by him were erroneously assigned by authors to Buenos Aires. This is the case of *Amaryllis breviflora* (Herb.) Seub., a native of the bogs of Santa Catarina. Even if Herbert does not mention any collector, it seems to me probable that this was Tweedie, especially if we consider the real origin of the plant. This thesis appears to be confirmed by the fact that a specimen was referred by Baker to the species, with the following data: "Buenos Aires, Tweedie!" (see Handb. Amaryll.: 35. 1888). Owing to the fact that Tweedie was in Córdoba for the first time only in 1835, we can be sure, even without judging characters, that *Habranthus magnoii* is not *H. robustus*.

Habranthus brachyandrus (Bak.) Sealy. According to Holmberg the bulbs of his *Zephyranthes porphyrospila* were gathered during a trip to the Argentinian province of Formosa; notwithstanding, he was not sure if they were found in the province of San Luis or truly in Formosa. Fortunately, it was possible to establish from the original description (no type-material exists), that *Zephyranthes porphyrospila* Holmb. is identical with *Habranthus brachyandrus* (Bak.) Sealy. The species is found in Paraguay and the Chaco region of Argentina; it is

frequent in Formosa and much cultivated in the former country and in the Argentinian province of Misiones (Oberá).

Rhodophiala bifida (Herb.) Traub, ssp. *aemantha* Rav. Hab.—Hills and fields southwards of the province of Buenos Aires.

It differs from the subspecies *bifida* by the smaller size of the plant, which has 2-3-flowered umbels and blood-coloured tepals, not pink or purple.

Eustephiopsis marginata (Pax) Fries. A species with pinkish flowers marked with yellowish and greenish inside. The leaves are almost always of a bright green or only slightly glaucescent; this point disagrees with Pax's statement. I found it in the province of La Rioja, in the mountains above Chilesito and of Famatina.

Eustephiopsis marginata (Pax) Fries, ssp. *latifolia* (Fries) Rav. It has red flowers yellowish inside; the larger leaves are grayish-glaucescent. I found a large population in the valley of Granadillas (28 km from Belén, Catamarca, Argentina), but not in flower. Flowers were found at Rumi-Rayán (Catamarca, dept. Tinogasta), a place at 2800 m of altitude; the inflorescences appeared alone, without leaves, in the hard vulcanic soil.

Hab.—Argentina from the province of Catamarca, through the mountains of Tucumán, Salta, Jujuy, to Bolivia; altitude 1800-3800 m above the sea level.

Rauhia megistophylla (Kraenzl.) Traub, Pl. Life 22: 5. 1966.—Ravenna, Sellowia 19: 33. 1967 (see also Pl. Life 24: 1969).—*Phaedranassa megistophylla* Kraenzlin, Engler Bot. Jahrb. 54, Beibl. 117: 2. 1916.—*Rauhia peruviana* Traub. Pl. Life 13: 74. 1957.

Phaedranassa megistophylla is an earlier binomial for the plant known as *Rauhia peruviana* Traub. Owing to the fact that *Rauhia* is considered as a valid genus, the specific epithet *megistophylla* is transferred. *Callithauma spathulatum* Herb. is probably referable to the same species; due to the fact that it is practically a *nomen nudum*, its use is not advisable.

During a memorable trip to the department of Amazonas (Peru), I had the unusual opportunity of observing in full flower a population of this amazing species. I found it at Pucará, near Bella Vista (Cajamarca, prov. of Jaen); this place can be considered as practically the same as the original one. I brought some of the large bulbs to Buenos Aires, but they could not stand for a long time our damp climate. However, it was possible to observe the peculiar large unusual leaves before its growth begins (in prefoliation or vernation); they are folded outwards in such manner that their margins touch.

Castellanoa marginata (Fries) Traub. A monotypic genus allied to *Chlidanthus* and *Stenomesson* (subgen. *Clinanthus*). The flowers of *Stenomesson humile* appear to be very similar to those of this genus.

In spite of the fact that *Castellanoa marginata* was already known not far from the Bolivian border, its presence was never recognized in that country. This is the first time that the genus is reported in the flora of Bolivia; this fact is supported by the existence of a dry specimen.

Hab.—High mountains of northern Argentina and the south Bolivia; altitude, 3400-3700 m above the sea level.

Hieronymiella aurea Ravenna, Sellowia 19: 34. Oct. 1967—Syn *Hieronymiella tintinensis* Hunziker et Cocucci, Kurtziana 4: 7. De 1967.

Bulb and *leaves* in the type-specimen absent. *Scape* cylindrica about 6-8 mm wide. *Spathe* 7-8-flowered, bivalved; valves marcescent membranaceous, unequal, ventricose downwards, narrower upwards, the lower about 94 mm long, the upper 100-104 mm long; inner bracts much smaller, often lanceolate or filiform. *Flowers* golden yellow, pedicellate, about 62-70 mm long, nearly 44 mm or more in diameter. Pedicels about 28-45 mm long. *Ovary* oblong about 9-14 mm long, 2-3 mm wide. tepaltube nearly 19-24 mm long. *Tepals* lanceolate, the outer ones about 45-50 mm long, 12.2 mm wide, apiculate (apicula about 1.2-2 mm long; inner ones subequal or narrower, acute. *Filaments* winged, somewhat unequal, wider near the apex, tepal-textured, rather connate between them, narrower and free downwards, about 37-38 mm to the base of the anthers, then prolonged in two lanceolate lobes, longer than the anthers (about 9 mm long), for each. Anthers oblong, sessile or nearly sessile, about 3-3.2 mm long. *Style* about 67-80 mm long; stigma trifid, lobes recurved, about 1.8-2.5 mm long.

Hab. and exsiccata.—Argentina: province of Salta, Amblaio; leg. C. Spegazzini, I-1987 (type LPS 19466). Cultivated in my collection from bulbs collected in the same place of the specimen.

This is the second species of the genus. Differs from *Hieronymiella chlidanthoides* because of its yellow flowers with a shorter tepaltube.

1a. Flowers white sessile or very shorty pedicellate .....*H. chlidanthoides*
1b. Flowers yellow, distinctly pedicellated .....*H. aurea*

The genus Solaria, its presence in the flora of Argentina.

In the following lines, a new species of the genus Solaria are described. Here the genus is noted for the first time in the flora of Argentina. In addition, the chromosomes of the species are reported.

Solaria R. A. Philippi, Linnaea 29: 72. 1857.—*Symea* Baker, Saunders Ref. Bot.: tab. 260. 1871.

Flowers slightly zygomorphic, pedicellate. *Tepals* lanceolate, united near the base, greenish or purple, narrow, attenuated toward the apex, the inner somewhat shorter, often slightly cucullate at their base. *Androecium* with three fertile stamens: the upper episepal and both lateral epipetal, sometimes with three staminodes without any trace of anthers, rarely bearing only one staminode; *filaments* connate toward the base in a ring; anthers introrse in the bud, basifixed, extrorses by reflexion after dehiscence when the flower expands. *Ovary* sessile with three ovules in each cell; style elongated ± arched; stigma apical, simple. Fruiting pedicels ± reflexed, longer than the floriferous ones. Capsule globose irregular loculicidal, with few seeds. Seeds globose-angled or oblong, slightly rugose, black, with a whitish hylum. Basic number of chromosomes, x=7.

Plants almost always weak, with a tunicated bulb. Leaf solitary navicular. Scape cylindrical. Spathe bivalved; valves membranous.

Type-species: *Solaria miersioides* R. A. Phil.

A genus closely related to *Ancrumia* Harv., from which it differs basically by having three fertile stamens (instead of two). Two or three species from high mountains of Argentina and Chile.

Solaria attenuata Ravenna, Bol. Soc. Arg. Bot. 11: 160. 1967.

Plant about 10-14 cm high. *Bulb* oblong-conical about 3-3.5 cm long, 9-12 mm wide; external tunics whitish or ash-ochraceous. *Leaf* single, naviculate, falcate, dark green, about 20-22 cm long, 4.4-6.5 mm wide. Scape about 11 cm long. *Spathe* bivalved, many-flowered; valves narrowly lanceolate. *Flowers* greenish about 10-22 mm in diameter. *Pedicels* floriferous about 10-22 mm long. *Tepals* narrowly lanceolate, united for 1.6 mm, outer ones about 10 mm long, 2 mm wide; inner ones slightly cucullate at the base, about 6.8 mm long, 0.9 mm wide. *Filaments* complanate, connate in a ring for 0.67 mm, free part about 1.25-1.4 mm long, 1 mm wide at the base, narrower at the apex; staminode shorter, acute, or none. *Anthers* quadrate-rotundate, about 0.7 mm long. *Ovary* sessile, nearly globose or nearly ellyptical, about 1.6 mm wide; locules with three ovules; *style* often curved or declined, rarely nearly straight; *stigma* at the summit, simple. *Pedicels* fructiferous about 11-50.6 mm long, flexuose, recurved. *Capsule* nearly globose, trivalved, about 8-9 mm wide, partially covered with the remains of the perigone. *Seeds* black somewhat rugose, with a distinct whitish hylum, about 22 mm wide. Chromosomes, 2n=14.

Habitat.—Rare in the Andes of Linares, Chile, and in the province of Neuquen, Argentina; it grows on stream banks and in woods.

This species differs from *Solaria miersioides* Phil. which is very similar, on account of the absence of two staminodes; apparently also the third is also sometimes lacking. Tepals are longer and more acute (from here the specific epithet). The whole plant is somewhat more robust, especially when in fruit. *Solaria major* Reiche was described as a higher plant.

Among the material of the genus determined as *Solaria miersioides*, deposited in the Natural History Museum (BA), a single sheet from the province of Santiago (Chile) was confirmed as belonging to that species. Due to this lucky circumstance, it was possible to make comparisons and to verify that the original description is correct. Another specimen from the province of Linares, proved to be identical with the Argentinian material. On the other hand, among the places of the genus quoted by Philippi, it is also written Linares; this points suggests that Philippi had the opportunity of seeing some material of *Solaria attenuata* Rav., but apparently he did not recognize it as belonging to a different species.

Solaria attenuata appears to connect the genus with *Ancrumia* Harv. The latter is distinguishable merely because of the existence of only two fertile stamens; This point could be a difference of specific rank.

Chromosomes.—From one of the herbarium specimens in fruit ci (Boelcke 10815), a bulb already with poison applied, but still alive, taken and planted. A short time later, appeared roots, and a leaf wh was not able to develop. Root tips were cut (approximately 3 mm they were pretreated with a saturated aqueous solution of paradicloroben zene for 4-5 hours and then were fixed with Carnoy for 48 hours. O of the tips was washed with distilled water, then immersed in norm 2 solution of hydrochloric acid for 5-10 minutes. The next step was t squashing in an orceine drop. This technique was successful. Chrom somes were seen distinctly from the cytoplasm not excessively staine Several cells were in an optimum stage for study. Three cells wer drawn with camera lucida, but only one was selected for this work Later permanent slides were made in the following way: freezing, de taching slide and cover-slip in absolute alcohol; previously these wer smeared with Mayer's albumin.

Solaria attenuata Rav. was shown to have a chromosome complemen of 2n=14, as follows: two pairs with a submetacentric centromere, two pairs with an acrocentric centromere, three pairs with subterminal centromere. In a pair of the latter group, the existence of satellite was noted.

Tristagma anemophilum Ravenna, Bol. Soc. Arg. Bot. 11: 147. 1967. Plant about 10 cm high (to the apex of leaves). *Bulb* oblong-ovoid about 12 mm. long, 7 mm wide, prolonged in a neck for 3.5-4.7 cm or more. *Leaves* 4-5 at flowering time, linear, slightly flexuose, about 5-10 cm long. 0.8-1.1 mm wide. *Scape* about 3-4 cm long, 1 mm wide. *Spathe* biflora; valves unequal, the lower about 15 mm long, the upper about 14 mm long, flowers pedicellate, whitish, cernuus, about 8-14 mm in diameter. *Pedicels* about 4.5-6 mm long. *Tepals* flattened, very narrow, nearly lanceolate, connate at the base for 2.6 mm; the outer about 11.4 mm long, 1.1 mm wide, the inner subequal. *Filaments* complanate, subulate at the apex, sepalines about 1 mm long, 0.4 mm wide at the base, petalines about 2 mm long, 0.6 mm wide at the base. *Anthers* oblong, yellow, about 0.7-0.8 mm long. *Ovary* obovoid, about 2.3 mm long, 2 mm wide; style thick, about 1.5 mm long, 0.7 mm wide, green downwards, whitish upwards; stigma capitate-trilobed.

Hab.—Argentina, Neuquén, on the mountains called Cordillera del Viento, alt. about 2200 m.

A closely related species to *T. patagonicum* (Bak.) Traub, from which it differs by the much smaller tepaltube and the very short filaments.

Tristagma nivale Poeppig. Plant about 12-22 cm high. *Bulb* ovoid-oblong about 12-32.5 mm long, 6-16 mm wide, whitish with somewhat fleshy roots; pseudoneck about 3.5-7 cm long. *Leaves* 3-6, linear, very often circinate especially toward the apex, or sometimes falcate or straight, about 8-24 cm long, 2-3.5 mm broad, somewhat obtuse at the apex. *Scape* about 5-18 cm long, 0.8-2.8 mm broad. *Spathe* 2-5-flowered; valves lanceolate about 14-23 mm long, connate for 1.6-4.2 mm at the base. *Flowers* purplish-black or greenish, cernuus. *Pedicels* about

10-35 mm long. *Tepals* united in a tube for 8.5-12.5 mm, then spreading, fleshy, blunt, about 4.7-7.5 mm long, 1-1.2 mm broad. *Filaments* nearly filiform or flattened but very narrow, the episepal group inserted at 3.5-3.7 mm from the base of the tube, about 1.2-2.5 mm long. *Anthers* erect oblong, yellow, about 1.3-1.7 mm long. *Ovary* sessile, ovoid about 2.2-3.5 mm long, 1.5-2.5 mm broad; style about 1.4 mm long; *stigma* capitate.

Hab.—Argentina, from the province of Mendoza to Tierra del Fuego, in the damp Patagonia or in the steppe; it is found also in Chile.

Variability in the flower colour and the circumstance that the leaves are not always spiraled has caused it to be classified as *T. eremophila* Speg. *Tristagma chubutense* Gandoger, poorly described, is a further synonym of the species.

Tristagma nivale Poepp., forma *australe* (Neger ex Dusen) Rav. It differs from the typical form because of its very short, nearly obsolete pedicels, and the shorter obtuse spathe-valves; no differences are found in the flower. *Tristagma inflatum* Rendle was based on a specimen with incipient fruits: during the fruiting process, the tepal-tube becomes swollen due to the growth of the ovary in the inside.

Tristagma patagonicum (Bak.) Traub. Additional synonym to be added: *Brodiaea viridior* Killip and *Tristagma viridior* (Killip) Traub.

Plant about 7-9 cm high. *Bulb* ovoid or ovoid-oblong, about 16-20 mm long, 7-9 mm wide, prolonged into a pseudoneck for 20-25 mm long. *Leaves* 1-2, linear, about 6-8 mm long, 0.7-1.8 mm broad, with a blunt apex. *Scape* weak, about 4.5-8 mm long, 0.8-1.1 mm broad. *Spathe* bivalved one-flowered; valves whitish, somewhat striated, lanceolate, about 19 mm long, 2.2-2.8 mm broad, connate for 2.2 mm toward the base. Flower pedicellate, erect, white, with a brown or greenish-brown streak on the outside of tepals, about 12 mm long, 20-35 mm in diameter. *Tepals* united for 11-20 mm, then spreading, the outer about 10-14.5 mm long, 2-6.4 mm broad, the inner about 8.5-10 mm long, 2-5.8 mm broad, both series blunt or more often acute. *Filaments* very narrow, the episepal group attached at 3.3-5.3 mm from the base of the tepal-tube, about 3-4.8 mm long, the epipetal group attached at 5.5-6.5 mm from the base of the tepaltube, about 3.5-5.5. *Anthers* oblong, obliques, yellow, about 1.1 mm long. *Ovary* oblong, about 2.6-3 mm long, 0.9-1.5 mm wide. *Style* filiform, about 5.5-7.7 mm long; stigma capitate-trilobed.

The name *Brodiaea luzula* was proposed by Macloskie in order to replace *Luzula patagonica* Speg. *(Juncaceae)*. This was due to a mistake of Spegazzini. In fact, when this author made the combination *Triteleia patagonica* (Speg.) Speg., he assigned erroneously the type to the sheet 366 (instead of the correct 362). The new name of Macloskie, was on account of Baker's earlier homonym in the same genus. Actually the number 366 was the type of the above mentioned *Luzula patagonica* (see Hauman 1917), a genuine member of the Rush Family. Spegazzini had never had the intention of transferring it to the genus *Triteleia (Liliaceae)*. Therefore, *Brodiaea luzula* Macloskie (and its further

combinations in other genera), must be considered as an absolute synonym of *Luzula patagonica* Speg., and not as was interpreted by Traub (1955), as belonging to the member of the *Liliaceae* mentioned. Incidentally, *Brodiaea patagonica* Bak., and *B. patagonica* Speg. are the same species; as a result, the further name given by Macloskie for the latter appears as superfluous.

Tristagma circinatum (Sandw.) Traub. and *T. viridior* (Killip) Traub, correspond to the very same species. Concerning the size of its flowers and tepals, *Tristagma patagonicum* is quite variable.

PLANT LIFE LIBRARY

THE BERING LAND BRIDGE, edited by David M. Hopkins. Stanford University Press, Stanford, California. 1967. 495 pp. Illus. $18.50. The history of Beringia, defined to include Western Alaska, Northeastern Siberia, and the shallow portions of the Bering and Chuckchi Seas, has from the beginning of the 20th century fascinated geologists, biogeographers, anthropologists, paleobotanists, mammalogists, and many others. There is good reason for the intense multidisciplinary and international interest in this strategic area of the earth's surface. It was over this narrow land bridge, joining Asia and North America, that numerous land plants, along with the horse, bison, mammoth, and many other animals including man himself, made their way into the New World. The Beringia land bridge was not a one-way street. Newly evolved species of land plants were exchanged between continents as readily as land mammal populations during Tertiary time.

This book of nearly 500 pages originated as a Symposium with the title, "Late Cenozoic History and Environments of the Bering Land Bridge", held at Boulder, Colorado, in August, 1965. The book is edited by the organizer of the Symposium, Dr. David M. Hopkins, Research Geologist with the Geological Survey. Dr. Hopkins has written the Introduction, and a concluding chapter with the significant title, "The Cenozoic history of Beringia—A Synthesis." This chapter attempts to condense the diverse subject matter of the Symposium into a meaningful summary. As a layman in such matters, I judge Dr. Hopkins efforts to be highly successful. In his role as Editor, Dr. Hopkins must have exerted a strong editorial hand. The subject matter of the Symposium is drawn tightly together, compared with other Symposia published in book form. In all, there are 24 chapters and 27 contributors, 9 of them Russian. Incidentally, the Russian contributions have been translated into English.

To one not knowledgeable about the complex geological history of the area, it comes as a surprise to learn that the Beringia land bridge was established and receded several times during the course of geological time. For instance, Beringia lay above sea level during most of the early and middle Tertiary. During this period it was part of a series of floral provinces that extended far to the south on both shores of the Pacific. During the Quaternary, which began about 3 million years ago, there were several fluctuations in sea level, alternately severing and reestablishing the land bridge. Even more surprising, a rapid rise in sea level drowned the Bering Land Bridge for the last time as late as 10,000 years ago.

For those persons with botanical training and interest, there are four chapters that deal with several aspects of the vegetational history of the area during the Quaternary, and one chapter that traces the history of the Okhotsk and Bering Seas by means of the diatom floras. Plant scientists with an interest in systematics and the processes of organic evolution will find much that is new and stimulating in the chapter by A. W. Johnson and A. G. Packer on "Distribution, Ecology and Cytology of the Ogotoruk Creek Flora."

Johnson and Packer have made skillful use of cytological data to supplement distributional and fossil information. They conclude that the Ogotoruk Creek-Cape Thompson flora consists of four major geographical elements; (1) an oceanic element, widespread along northern strands; (2) an arctic element that evolved in the mountainous regions to the south, in North America or Eurasia; (3) an arctic element that evolved and remained **in situ**; and (4) a boreal element that is primarily associated with the boreal forest.

In discussing the four elements in this flora. Johnson and Packer make the significant statement that, "On the basis of the polyploid spectrum within each of these elements, it appears that the oceanic and montane elements, both high in diploids, have evolved under relatively stable conditions, whereas the high frequency of polyploid species in the arctic and boreal elements suggests conditions of relative instability favoring the survival of newly formed polyploid species."

This review cannot do justice to the merits of the book. The two chapters on man will be of special interest to all biologists; one by Hans-jürgen Müller-Beck of the University of Freiburg (On Migrations of Hunters across the Bering Land Bridge in the Upper Pleistocene), and the other by W. S. Laughlin of the University of Wisconsin (Human Migration and Permanent Occupation in the Bering Sea Area).

The book is attractively printed and bound for which we can thank the Stanford University Press. There is a General Index and an Index to Faunal and Floral Taxa. Regrettably the book is so expensive ($18.50) it will probably not be purchased by those for whom it would be most useful.—**Thomas W. Whitaker**

GENETICS OF FUNGI, by Karl Esser and Rudolf Kuenen. Springer Verlag, New York. 1967. Pp. 500. $18.50. "Genetics of Fungi" by Karl Esser and Rudolf Kuenen is a typical example of German scholarship; thorough, meticulous, detailed, and comprehensive. The authors are well qualified for the task of summarizing and interpreting the results of genetic research with fungi. Each has been a steady contributor to an understanding of hereditary mechanisms in **Podospora anserina**, an organism infrequently used by American and English investigators.

"Genetics of Fungi" comprises about 500 pages, organized into seven chapters which follow each other in logical sequence. They are: Morphology, Reproduction, Replication, Recombination, Mutation, Function, and Extrachromosomal Inheritance. One of the short chapters has a terminal Summary, but for the remainder, every topic within a chapter is summarized when the discussion is completed. Each chapter ends with a list of Literature Cited which for some chapters runs to as much as 21 pages and 550 titles. A supplement has been added to the literature list of each chapter after the German manuscript was completed. This device is an obvious attempt to make the text current in this fast moving field of investigation where much work is out-of-date before it reaches the press. The supplement updates the literature through 1966.

This book will no doubt have permanent value as a reference work. Graduate students with a primary interest in fungi, and senior investigators of problems concerned with fungal genetics will have constant need for the book, if for no other reason than as a handy source of pertinent literature for their investigations. I should make haste to add that the book is no annotated bibliography, but attempts the difficult assignment of explanation, interpretation and synthesis. The authors must be given good marks for achieving in a large part their major objectives.

While they usually define the technical terms peculiar to fungal morphology and genetics when first used, in my opinion it would have improved the book for use as a reference tool if these definitions were gathered together in a Glossary. Also, I find it strange that the genetics of plant pathogenic fungi go practically unmentioned. For example, the elegant experimental work of H. H. Flor with flax rust certainly deserves

a prominent place in a reference book on fungal genetics, but this fundamental work is not even cited.

Fungal geneticists will applaud Prof. Erich Steiner of the University of Michigan for a first rate translation. It indeed must have been a labor of love. Translating a technical reference work of this magnitude is something that is not lightly undertaken, and cannot be done in spare time between classes, or riding to and from the laboratory on bus or subway.

The book has a short Appendix, an Author and a Subject Index. It is pleasantly written and copiously illustrated. Investigators and students with an interest in fungal genetics are now served by two excellent texts that complement each other to a considerable degree; the one under review, and Fincham and Day's "Fungal Genetics." The "Genetics of Fungi" is priced at $18.50, which at first glance seems excessive, but is nevertheless reasonable for a book of this nature.—**Thomas W. Whitaker**

PHYLO-GENETIC SYSTEMATICS, by Willi Hennig; translated by D. Dwight Davis and Ranier Zangerl. University of Illinois Press, Urbana, Ill. 1966. Pp. 362. Illus. $12.50. Hennig's 1950 work on phylo-genetic systematics had been available only in the German Language and thus had not been adequately considered by others in the continuing synthesis of bioevolutionary theory as applied to systematic biology. Therefore, we are greatly indebted to Drs. Davis and Zangerl, and the University of Illinois Press, for this translation of the completely revised edition of Hennig's text, and which makes it available to students of biosystematics. Although the book is difficult to read, the extra effort required is well worth the stimulation received in learning about Hennig's outlook on biosystematics. He is uncompromisingly in favor of a system of phylogenetic classification. The book is divided into four sections: (1) the position of systematics among the biological sciences; (2) tasks and methods of taxonomy, (3) problems, tasks and methods of phylogenetics, and (4) concluding remarks. This is required reading for all interested in biosystematics.

PLANTS, MAN AND LIFE, by Edgar Anderson. University of California Press, Berkeley, Calif. 94720. 1967. Pp. ix + 251. Illus. This revised edition of a stimulating book by an outstanding authority on "man's influence on plant life, particularly crop plants" will be welcomed by all. The topics covered include: man and his transported landscape, history of weeds; the greater paradox (inadequate study of cultivated plants and weeds by botanists); the clue from the root-tips—caryology and genetics; the clue from diversity—variation under cultivation; how to measure an avocado; budgets vs. scholarship; uneconomic botany; dung heaps and the origin of agriculture; our most important crop plants and their probable origin; sunflowers, the one native American crop; and adventures in chaos—need of application of the taxonomic method to cultivated plants. This outstanding book in its field is highly recommended to amateur and professional plant scientists.

INTROGRESSIVE HYBRIDIZATION, by Edgar Anderson. Facsimile of the 1949 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. ix + 109. Illus. $5.50. The reprinting of this stimulating book on introgressive hybridization, the repeated back-crossing of hybrids to one or both parents, by an outstanding authority, will be welcomed. It is concerned with such hybridization in the field under natural conditions, particularly with how the effects of hybridization can best be measured in natural populations. Highly recommended to all plant scientists.

AMERICAN BOTANY, 1873-1892, by Andrew Denny Rogers III. Facsimile of the 1944 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 340. Illus. $8.75. Subtitled, "Decades of Transition", this book provides an historical perspective for an important period in the development of American Botany. The account begins with the work of Asa Gray; and then follows consideration of Government surveys and explorations, including paleobotany, and explorations in North America; morphology; paleobotany and the coal floras; Englemann's work; agricul-

tural experimentation, the Greene-Gray controversy; Mexican, Central, and South American explorations; Gray's last years, and the beginning of the new era in North American botany. Required reading for all interested in plant science.

ARBUSTUM AMERICANUM, by Humphrey Marshall. Facsimile of the 1785 Edition; and CATALOGUE ALPHABETIQUE DES ARBRES ET ARBRISSEAUX, by Humphrey Marshall (French translation). Facsimile of the 1788 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. xii + 174; xxiii + 278. Illus. $20.00. This is the first book on American trees—"the American Grove"—published in the colonies. The facsimile edition of the English text and the translation into French are preceded by an introduction by Joseph Ewan. The text was written by the nurseryman, Humphrey Marshall, who established the second botanic garden in the colonies. This is an important work since many tree species were described in it for the first time, based on living plants. Up to now, the work has only been known as a rare book, and we are indebted to Dr. Ewan and the Hafner Publ. Co., for this fine facsimile reprint which makes it available to all plant scientists. It is highly recommended to all interested in plant science.

FLORULA LUDOVICIANA, by C. S. Rafinesque. Facsimile of the 1817 edition, with an introduction by Joseph Ewan. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. xl + 178. $12.50. The controversial book is subtitled, "A Flora of the State of Louisiana; translated, revised, and improved from the French of C. C. Robin". It was composed by the eccentric Rafinesque, who never visited the State and "who rashly equated the running text of C. C. Robin's catalog into a systematic account." Effectively suppressed by Asa Gray and his colleagues, this book was almost unknown to plant scientists. Now, thanks to Dr. Ewan, who has contributed an adequate introduction, and the Hafner Publ. Co., who produced this fine facsimile edition, it is now made available to all students of systematic biology for critical study.

THALASSIOPHYTA AND THE SUBAERIAL TRANSMIGRATION, by A. H. Church. Facsimile of the 1919 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 95. Illus. $4.00. This reprint of Church's stimulating views on the evolution of land plants will be welcomed by the new generation of plant scientists who have not had the opportunity of obtaining the original edition. Highly recommended to all interested in evolutionary biology.

ON THE INTERPRETATION OF PHENOMENA OF PHYLLOTAXIS, by A. H. Church. Facsimile of the 1920 Edition. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 58 + 16. Illus. $3.50. This facsimile of the 1920 edition will be welcome since it has long been out of print. In it the essential theory behind phyllotaxis is explained according to Church. It deals with the causes of leaf origin, the meaning of the term, "leaf"—extension of a plant soma, its phylogeny and secondary adaptation. Highly recommended to all plant scientists.

SWARTZIA (LEGUMINOSAE, CASEALPINIOIDEAE, SWARTZIEAE), by Richard S. Cowan. Monograph No. 1. Flora Neotropica. Hafner Publ. Co., 31 E. 10th St., New York, N. Y. 10003. 1968. Pp. 228. Illus. This represents a thorough study of the American species of the genus **Swartzia**, with 127 species in Tropical America. After a brief consideration of the history of the genus, the morphology, phylogeny and distribution, generic diagnosis, and keys to subgeneric groups and species, the individual species are described in detail. Highly recommended to all interested in the flora of Tropical America.

PLANT PROPAGATION, by Hudson T. Hartmenn and Dale E. Kester. 2nd Edition. Prentice-Hall, Inc., Englewood Cliffs, N. J. 07632. 1968. Pp. x + 702. Illus. $14.00. Subtitled, "Principles and Practices", this second edition, revised and un-dated encyclopedic work on plant propagation for amateur and professional horticulturists will be welcomed. The five sections

are devoted to general aspects of propagation; sexual and asexual reproduction; special methods of propagation; and propagation of selected plants. Although the coverage is wide, the extensive literature on bulb-cuttage (for survey see Traub—"The Amaryllis Manual, 1958; Herbertia 1934-1949) is omitted. Such minor defects can easily be remedied, and this outstanding cyclopedia on plant propagation is highly recommended to all horticulturists.

PLANT PATENTS; WITH COMMON NAMES, 1967 SUPPLEMENT, 2699 THROUGH 2783. Publ. by the American Association of Nurserymen, 835 Southern Bldg., Washington, D. C. 20005. 1968. Pp. 7. $0.50. This is a supplement to the listings of plant patents granted in 1967. The subject matter is arranged under three parts: I. Numerical Listings, II. Alphabetical Listings under common names, and III. Alphabetical Listing of names and addresses of originators or discoverers and assignees.

MANUAL OF WAYSIDE PLANTS OF HAWAII, by Willis T. Pope. Charles E. Tuttle Co., Rutland, Vt. 05701. 1968. Pp. 289. Illus. $6.00. Most of the Hawaiian "wayside plants" have been introduced from other regions. These include "smaller plants that may ordinarily gain attention in the fields, waste-lands and along road-sides . . . which persist without intentional human assistance." These are considered under the color of flower key; poisonous and medicinal plants; weeds and their control, and an extensive descriptive catalog of plants with illustrations arranged under plant families. Recommended to all who are interested in the flora of Hawaii.

POISONOUS PLANTS OF HAWAII, by Harry L. Arnold. Charles E. Tuttle Co., Rutland, Vt. 1968. Pp. 69. Illus. $2.50. Most of the more than 90 poisonous plants of Hawaii discussed in this book have been introduced from other regions. First the common and dangerous plants of Hawaii are grouped on the basis of allergic reactions, and mushroom-like fungi. This is followed by a detailed catalog of poisonous plants with illustrations. Recommended to all residents of, and visitors to, the Hawaiian Islands, and to students of poisonous plants.

HAWAIIAN FLOWERS & FLOWERING TREES, by Loraine E. Kuck and Richard C. Tongg. Charles E. Tuttle Co., Rutland, Vt. 05701. Popular edition, 7th printing 1967. Pp. vii + 158. Illus. $2.95. Subtitled "A Guide to Tropical & Semi-tropical Flora", this attractive book will be welcomed. The many flowering herbs and trees that appear in the Hawaiian floral pageant have been introduced from various regions of the world, and these are profusely illustrated in color in the descriptive catalog. In each case the common and scientific names, place of origin, plant description, notes on habitat, flowering season, and other details of interest are given. Highly recommended to all interested in the flora of Hawaii.

MORPHOGENESIS IN PLANTS, by C. W. Wardlaw. Barnes & Noble, 105 5th Ave., New York, N. Y. 10003. 1968. Pp. 451. Illus. $14.50. Subtitled "A Contemporary Study", this new enlarged and completely revised version of the 1952 edition, by the outstanding authority in this field, will be welcomed. It incorporates the notable contributions made in plant morphology since 1952, and emphasizes the integrated unity of the individual organism. This sets it apart from other texts. This is required reading for all interested in plant science.

PLANT VIRUSES, 4th Edition, by Kenneth M. Smith. Barnes & Noble, 105 5th Ave., New York, N. Y. 10003. 1968. Pp. ix + 166. Illus. $5.00. This completely rewritten, and expanded new 4th edition of an outstanding text fills a definite need. After characterizing viruses, chapters are devoted to symptomology of virus-infected plants; physiology of plant virus diseases; isolation of plant viruses; morphology and ultrastructure and chemistry of viruses; transmission by vectors and other than vectors; quantitative assay and serology of plant viruses; tissue- and cell-culture of plant viruses; indicator plants; and nomenclature and classification. The subject is presented in a concise and easily readable manner, and is highly recommended to all interested in plant viruses.

ESSAYS ON FORM IN PLANTS, by C. W. Wardlaw. Barnes & Noble, 105 5th Ave., New York, N. Y. 10003. 1968. Pp. xiv + 399. Illus. $8.75.

This volume includes various essays published previously by the author on the subject of form in plants. In Part 1, the history of plant morphology is detailed, including the author's outlook on the subject. Part 2 is concerned with discussions on the unification of botanical science; and Part 3, is devoted to perspectives in morphogenesis. These stimulating essays are highly recommended to all interested in plant science.

SUPPLEMENT (1961—1965); CHECK LIST OF PLANT AND SOIL NEMATODES, by Armen C. Tarjan. University of Florida Press, 15 N.W. 15th St., Gainesville, Fla. 1967. Pp. xiii + 115. $6.00. This book supplements the original "Check List of Plant and Soil Nematodes" (1960), and brings the subject up-to-date, from 1961 through 1965. The changes and additions to species names validly proposed under the Int. Rules of Zoological Nomenclature are listed chronologically. This book is indispensable to all interested in nematology.

THE PRESERVATION OF NATURAL HISTORY SPECIMENS, edited by Reginald Wagstaffe and J. H. Fidler. Volume II. 1968. Philosophical Library, 15 E. 40th St., New York, N. Y. 10016. 1968. Illus. Pp. xv + 404. $17.50. This work includes sections on the preservation of fishes, amphibians, reptiles, birds and mammals as well as botanical and geological material. In addition, special sections deal with casting reptiles, amphibians, whales, and the modeling and casting of relief maps. Vol. I (Part 1), previously published, covers the invertebrates. Vol. II, under review here, is in three parts: Part 2. Zoology, vertebrates; Part 3, Botany and Part 3, Geology. This is a required reference work for all naturalists, professional and amateur.

PAPERS ON PLANT SYSTEMATICS, edited by Robert Ornduff. Little, Brown & Co., 34 Beacon St., Boston, Mass. 02106. 1967. Pp. x + 429. Illus. paper cover, $6.00. The editor is to be congratulated on a happy choice of research papers pertinent to plant systematics. About half of these papers have appeared since 1960, and all but four were published since 1950. They are grouped under I, anatomy and morphology; II, cytology, embryology and genetics, III, biochemical systematics, and IV, field and garden studies. Indispensable for all interested in plant systematics.

PAPERS ON PLANT GROWTH AND DEVELOPMENT, edited by W. M. Laetsch & R. E. Cleland. Little, Brown & Co., 34 Beacon St., Boston, Mass. 02106. 1967. Pp. x + 479. Illus. $6.00. The reprinting of these research papers by outstanding authorities is timely, in response to the attention being given to developmental problems in plant physiology. The papers are grouped under: I, natural plant growth regulators; II, control of growth in intact systems by growth regulators; III, correlative control of growth; IV, role of light in plant growth; V, control of growth in isolated organs; VI, control of differentiation; VII, experimental control of form, and VIII, mechanism of growth regulator action. Highly recommended to all interested in plant physiology.

CELL FUNCTION, by L. L. Langley. 2nd Edition. Reinhold Book Corp., 430 Park Ave., N. Y. 10022. 1968. Pp. xiii + 364. Illus. $10.00. This thoroughly revised edition of an outstanding text on intracellular activities will be welcomed. The topics discussed include size and organization of the cell; biostatistics; gas laws, the liquid state and solution; electricity; methodology; protoplasm and cell membrane; metabolism, basic principles and reactions; mitochrondria; lysosomes; electrical activity; movement, reproduction; growth and decline. Highly recommended to all interested in physiology.

PLANT LIFE LIBRARY—continued on page 4.

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. AMARYLLIDACEAE: TRIBE AMARYLLEAE, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.

This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila

covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $5.00 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and descriptions of all the genera. Every member of the Society should have this book for constant reference. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

4. LINEAGICS, by Hamilton P. Traub. This is the first outline text for the undergraduate student on the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics and lineagics as an integrated science; (b) basic lineagics, principles and procedures; (c) applied lineagics, principles and procedures; and (d) research methods in lineagics. Recommended for the student in biology. Publ. 1964. Manila covers, 163 pages, incl. 8 illus. $5.00 postpaid.

PERIODICALS

(A) HERBERTIA [First series, 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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6-10 (1939-1943), $20.00, postpaid.
11-15 (1944-1948), $20.00, postpaid.

1-15 (1934-1948), $58.00, postpaid.

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Vols. 1—25, 1945-1969, $106.90 postpaid

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